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THE NATURE AND SIGNIFICANCE OF THE CHANGES IN THE BIRTH AND DEATH RATES IN RECENT YEARS.*

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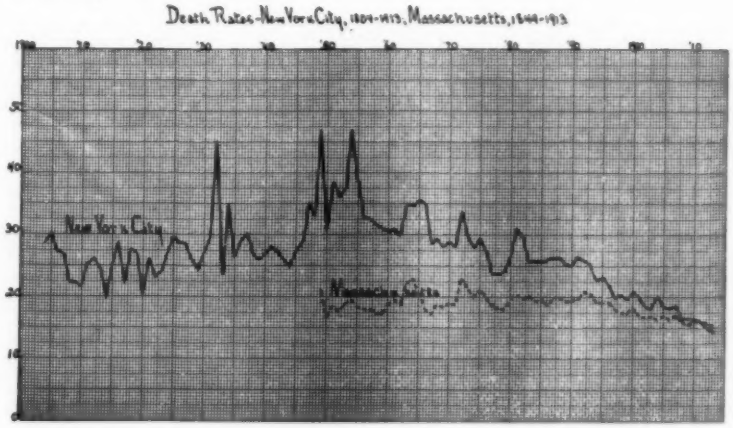
Certain important changes in death rates are revealed by a diagram showing annual death rates for a populous area through a long series of years. The American districts best satisfying these two conditions are Massachusetts, for which the death rate since 1849 is known, and the old New York City, for which the death rates run back now through more than a century.

The accompanying diagram shows the death rate in each of these areas for each year from the beginning of registration to the present date.



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This diagram illustrates what a larger body of evidence would confirm, that the perceptible and steady decline in the death rate is a relatively recent phenomenon. In order to test the correctness of this inference, the average death rate has been computed for each decade and the ratio found between that rate and the rate in the preceding ten years taken as 100. The results are as follows:

Date.	Death Rate in		Ratio of Rate to that in Preceding Decade = 100.	
	New York City.	Massachusetts.	New York City.	Massachusetts.
1804–09	26.3	....	....	....
1810–19	24.7	....	94.2	....
1820–29	25.8	....	104.2	....
1830–39	29.8	....	115.7	....
1840–49	30.3	....	101.5	....
1850–59	35.6	18.0	117.7	....
1860–69	31.7	19.4	89.0	107.8
1870–79	27.6	19.7	87.2	101.6
1880–89	26.8	18.6	97.1	99.6
1890–99	23.1	19.1	86.0	97.1
1900–09	19.0	16.0	82.3	84.0
1910–13	15.3	15.5	80.6	96.7

These figures show that the decennial death rate in New York City rose for the forty years following 1810–19, but has been falling since the Civil War and is now much lower than ever before. In Massachusetts the rate rose until about 1880 and has been falling since that date, but at a slower rate than in New York. Decennial rates for at least two decades have been obtained in twenty-seven European countries and in every one the rate for 1901–10 was lower than for any previous decade. This evidence shows that the decrease of the rate is well-nigh universal in Europe. A few exceptions to the rule, however, are found in other parts of the world; namely, Ontario, Canada, Connecticut, Michigan, Vermont, Chile, Jamaica, Japan, and Ceylon. But in some of these the rates at earlier decades were incredibly low and the apparent increase was probably due, in part at least, to more complete returns of deaths in the later years.

The diagram also suggests that the annual fluctuations began to decrease at about the same time that the rates began to fall. To judge whether this is a general or only a local

change, conditions in the twenty-three countries of Europe* for which the rates as far back as 1870 are known have been examined. The average annual variation has been determined. Naturally the successive years between which the greatest variation occurred were the years of transition from peace to war or *vice versa*. Thus, the greatest changes occurred between 1871 and 1872 and between 1870 and 1871. The war of 1876 exerted a less noteworthy influence. On the whole, the annual fluctuations have decreased but the change is less obvious and uninterrupted than students of individual cities or countries might expect.

Both the steady decrease in the death rate and the slow reduction in the annual fluctuations mark and measure man's progressive emancipation from physical ills of disease or famine, which are closely dependent upon climate and season, and we might have thought, before August, 1914, from the political ills of war and revolution.

In New York State between 1894 and 1909 there was a marked decrease in mortality during July and August as compared with the average for the entire year. I believe no similar studies have been made for other states. In default of other evidence we may conclude that one factor in the diminishing death rate has been an increased control of deaths in summer. If this should prove to be a general fact, it would probably be connected with the success of efforts to reduce infant mortality. The hot months are especially dangerous to infants, while the cold months are especially dangerous to the aged.

Age influences the death rate more powerfully than any other physiological factor. Most people know that the death rate is lowest at the age of puberty and very much higher at the beginning and end of life. But the amount of difference is not commonly realized. In New York State boy babies under one year of age suffer from a death rate 65 times that of boys of 10 to 14. The death rate of nonagenarians rises to 159 times that of the youth.

It would be a natural expectation of one who is told that the death rate is rapidly falling that the gains had been distributed

* For this purpose the three divisions of Great Britain and Ireland and the eight divisions of the German Empire have been treated as countries.

somewhat evenly up and down the scale of years. But this anticipation is not borne out by the facts. Even in a hurried survey like this, two points, the possible increase of infant mortality and the possible increase of mortality among the aged, call for mention.

High medical authority in England alleged nearly ten years ago that infant mortality is stationary or increasing and this conclusion won some acceptance in the United States. Fortunately the figures proved to be susceptible of another explanation. But into that question there is now no need to go, since even in England and on the face of the figures infant mortality has decreased since 1900. Indeed among the nineteen countries of Europe for which statistics are at hand there is not one in which infant mortality has shown no decrease since the beginning of the twentieth century. In the United States the registration of births is still very defective and there are no large population groups for which we know the true infant mortality, that is, the number of children dying in the first year of life to each thousand living births. Our best substitute for this figure is the ratio between the deaths under one year of age and the living children under one. In the registration states of 1900, comprising 26.3 per cent. of the country's population, this ratio fell from 162.4 per 1,000 in 1900 to 141.7 in 1910, indicating that infant mortality fell about one eighth in the decade.

When we turn to the other end of life, the indications of our American figures are less gratifying. In the registration states of 1900 the death rate decreased between 1900 and 1910 for every age period below 55 and increased at nearly every age period above 55. On this point our experience is apparently at variance with that of Europe. The latter indicates that before 1900 the fall in the death rate as a rule extended to all ages and was especially great at ages between 5 and 53, but that for ages above 55 it was slight or in some countries absent.* The English life tables published in 1915 and speaking for a more recent period show that at every age above 5 years the mortality in 1901–10 was less than that in 1891–

* March, Statistique intern. du Mouvement de la Population, Vol. I, pp. 431–439 and 450.

1900 and that the mortality in 1910–12 was less than that in 1901–10.*

The apparent increase of mortality at high ages in our registration states, in opposition to the general trend in other countries, invites and should be given more careful and thorough analysis than it has thus far received or than I have been able to give it for this paper. Although it appears in both sexes, it does not show itself among women until the age of 60 is reached, while among men over 45 the death rate in 1910 exceeded that in 1900. It appears also among the three classes of native white, foreign born white, and colored, earliest among the colored with whom the increase appears in each sex at every age above 30, latest among the foreign born whites with whom the increase does not appear in either sex until the age of 60 and then for females appears only for the ten year age period 60–69. It appears in a prevailingly agricultural state like Vermont at an earlier age and more definitely than it does in a prevailingly industrial state like Massachusetts or Rhode Island. In a recent reference to this change, based mainly upon the figures for Massachusetts and New Jersey between 1880 and 1910, three possible causes were mentioned, "the amalgamation of the various races that constitute our population," "lack of adaptation to our rapidly developing civilization," and "some unknown biologic influence," and a preference for the second was indicated.† Thus far no evidence has been produced, I believe, showing that the increase is greatest where amalgamation of races is probably affecting the largest proportion of the population or where the lack of adaptation to a developing civilization is greatest.

An influence upon mortality which the United States is in a more favorable position to investigate is that of *race*. Under this term I do not include those residents in the United States who or whose progenitors were born in a certain country or spoke a certain language, like the Scandinavians or the French Canadians. At some future time we may be able to investigate the death rate of groups like those, although the present position and sluggish development of American vital statistics

* Reg. Gen., Supplement to 75th Ann. Rep., Pt. I, Life Tables, p. 20.

† Fisher and Fisk, How to Live, p. 282. See also Lewinski-Corwin in New York Times, Magazine Supplement, Dec. 19, 1915.

make one fear that the facts may become inaccessible before the country is ready to study them. I refer here to the two great races of white and Negro, which include between them more than 99 per cent. of our population. The registration states of 1900 contained in that year 19,544,821 whites and 388,198 Negroes and many more in 1910, groups large enough and residing in states widely enough scattered to make the changes in their death rates between 1900 and 1910 somewhat representative of the changes in the whole country.

The death rate of whites in these states fell from 17.0 in 1900 to 15.5 in 1910, a decrease of 1.5 per 1,000, or 8.8 per cent. of the initial rate. Meantime the death rate of Negroes in the same states fell from 25.6 in 1900 to 25.0 in 1910, a decrease of 0.6 per 1,000, or 2.3 per cent. These figures show that the fall in the death rate during the decade was more than twice as great among whites as among Negroes. Stating the same change in another way, the death rate among Negroes in these states exceeded that among whites by 51 per cent. in 1900 and 61 per cent. in 1910.

But to compare the two races in this way and stop without noting whether significant differences exist between the age and sex composition of the two groups might easily lead us into error. Thus among the whites 50.5 per cent., but among the Negroes only 48.3 per cent. were male. As the female death rate is regularly lower than the male, the true difference between the death rate of the races would probably be greater than the foregoing figures indicate. Even more important is the fact that of the whites 21.5 per cent., but of the Negroes only 16.1 per cent. are either children under 5 or aged 55+ and have the high death rate characteristic of infancy and old age.

Probably the best way to measure the effect of these differences in sex and age composition is to compute standardized death rates for each race. When the death rates of each race for a given sex and age are applied to the population of the same sex and age in a standard million distributed as in the registration states of 1900, the standardized death rate in 1910 is found to be 15.5 for whites and 27.5 for Negroes, showing that the corrected death rate of Negroes exceeds that of whites

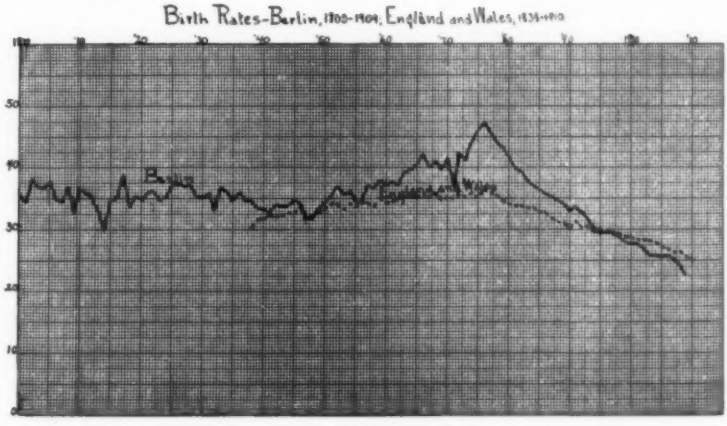
by 12.0 per 1,000, or 77 per cent. The corresponding standardized death rates in 1900 were 16.9 for whites and 29.0 for Negroes, showing a fall during the decade of 1.4 per 1,000 for whites and 1.5 per 1,000 for Negroes. But in 1900 the standardized Negro death rate exceeded that of the whites by 72 per cent. as compared with 77 per cent. in 1910. The standardized death rate among female Negroes exceeds that among female whites by 61 per cent. in 1900 and by 72 per cent. in 1910, while the difference among males was 69 per cent. in 1900 and 84 per cent. in 1910, showing that the difference between the males of the two races is greater and increasing more rapidly than among the females. The death rate of each race is falling, but the gap separating the two races has seemingly grown wider. Before the Civil War, according to what evidence we have, the death rate of Negroes exceeded that of whites by 29.8 per cent. of the lower rate, and in 1890 the difference was 56.5 per cent. These earlier rates are not strictly comparable with each other or with those for 1900 and 1910, partly because they speak for different areas, neither of which agrees with the registration states of 1900, and partly because in them no attempt has been made to allow for differences in the age and sex composition of the two races or for changes in these respects. The general conclusions, however, that the death rate of each race has fallen by approximately the same amount and that the ratio by which the Negro rate exceeds the white has been rising, seem to be supported by evidence enough to make them deserve acceptance.

Still another influence upon mortality which has been recently investigated is that of *marital condition*. European figures indicated long ago that the mortality of husbands is much less than that of bachelors or widowers of the same age and the conclusion is now corroborated by figures for New York State. No doubt this difference is largely due to the selective process by which the men who marry are, on the average, at the time of marriage more healthy and vigorous than men of the same age who do not marry. Evidence that direct benefits to health accrue from married life is found in the death rate of widowers, which is much higher than that of husbands, in the death rate of Catholic celibate clergy, which

is higher than that of Protestant clergy, most of whom are married, and in the death rate of all males during the years at which marriage is most common. The normal and usual course of mortality in each sex is for a slow but steady increase to begin just after the minimum is reached in the early teens, and to continue with accelerating rapidity to the end of life. To this course there is no significant exception among women, but among men in several countries the increase is checked or even turned into a slight decrease for a longer or shorter period between the ages of 20 and 35 when marriage is most common. The probable explanation is that the normal increase of mortality during these years is nearly or quite neutralized by the steady transfer of many men from the less healthy bachelor state to the more healthy married state. The explanation finds some support in the fact that during these years the death rate of bachelors treated separately rises steadily with age. On the whole, the evidence justifies the inference that marriage exerts a directly beneficial influence on men's health and prospects of longevity. For wives the facts are less favorable. In New York the death rate of wives between 20 and 29 is greater than that of single women at the same age period. The difference is slight and part of it no doubt is due to the fact that wives 20 to 29 years of age are, on the average, more than two years older than spinsters belonging to the same age group. But as less than half the difference can be thus explained, it seems clear that in New York, as in most other areas in which the facts have been determined, during the early years of married life wives have a higher death rate than spinsters and probable that the difference is largely due to the dangers attending childbirth, especially among primiparae. But though the mortality of wives 20–29 years old is greater than that of spinsters or husbands it is less than that of bachelors.

There are no American *birth rates* which extend over a long series of years and may be trusted as accurate. In default of evidence from this country I have used in the diagram the birth rates for England and Wales since 1838 and for Berlin since the beginning of the last century. The diagram shows that the birth rate was probably at its maximum about 1875

and has decreased almost steadily since that date, that the decrease in England has been about one third and in Berlin about one half of the maximum amount, that the variations both from year to year and through longer periods were greater in the city than in the entire state, that the decrease since 1876 has been almost uninterrupted, that there was a marked depression in both areas in 1890, and that Berlin had a much more notable depression in 1871. If in the other diagram we had used the death rates for Berlin, high points on that curve would have been revealed in 1871 and 1890 when the birth rates were low.



As a rule influences which tend to increase deaths tend also to decrease births, and influences which tend to decrease deaths tend to increase births. This appears even in the rhythm of each day, Italian figures apparently showing that deaths are most frequent and births least frequent in the afternoon. There is also a yearly as well as a daily rhythm traceable in the figures but in this case the reciprocal relationship is between conceptions as mirrored in the births nine months later and deaths. There is some evidence that during the late spring and early summer and again during the late fall the death rate is low and the conception rate high. There is some evidence, likewise, that during the late winter and the late summer the death rate is high and the conception rate low.

This reciprocal relationship between births or conceptions and deaths appears also in the case of any great social calamity. As a war or a pestilence raises the death rate, so likewise it depresses the birth rate, and in estimating the social effect of either it is of the first importance to consider not only the deaths it has caused but also the births it has prevented. For example, in Massachusetts between 1860 and 1864 the death rate rose from 18.7 to 22.8, an increase of 4.1 per 1,000, and the birth rate fell from 29.3 to 24.2, a decrease of 5.1 per 1,000. In Sweden continuous and trustworthy records of births and deaths have been maintained without a break since 1749, a longer period than in any other country. The year 1773 was marked by the heaviest death rate of this century and two thirds and during that year the birth rate was also lower than in any year before or since. The most universal and fatal epidemic which has afflicted civilized countries of recent years was probably the first of the recent visitations of influenza, which spread over Europe and America in the winter of 1889–90 and caused in New York State about 5,000 deaths. Wherever the births were reported and published by months one finds, nine months after the influenza epidemic was at its height, a marked shortage of births. There were at least 200,000 fewer births in Europe in 1890 than the average annual number for the preceding five year period.

Now the most marked change in the birth rate during the last half century, a change revealed by a comparison of the two diagrams, has been the gradual decline and almost complete disappearance of this reciprocal relationship between births and deaths and the appearance in its place of a tendency for births and deaths to change in the same way rather than in opposite ways. Before proceeding to consider the causes, let me set forth the facts a little more fully.

1. The birth rate and death rate now remain approximately the same in any given country during any few years. The sharp annual variations which characterized these rates and which are still traceable in the statistics of undeveloped countries are disappearing.

2. The tendency of both death rates and birth rates is to undergo large and important modifications in longer

periods of time. The sharp up or down movements in both curves connected with such causes as war, pestilence, or famine, on the one hand, or bountiful harvests and cheap food, on the other, are being succeeded by a steady progressive downward movement in the death rate and the birth rate.

Regarding the birth rate in the United States we know practically nothing. But in default of this information I have found an available substitute by comparing the number of children under 5 years of age at the date of each census with the number of women 16–44 years of age at the same census. The results are given in the following table, in which the figures before 1850 are estimated from such data regarding sex and age as the earlier censuses afford.

Date.	Number of Children Under 5 Years of Age to 1,000 Women 16–44 * Years of Age.
1800	976
1810	976
1820	928
1830	877
1840	835
1850	699
1860	714
1870	649
1880	635
1890	554
1900	541
1910	508

During the sixty years 1850–1910 the number of children to 1,000 women of child-bearing age decreased in the United States by 191, or an average of 32 in each decade. There are only about seven tenths as large a proportion of children in the United States now as there were in 1850. If we assume that the change will continue in the direction in which it has been moving ever since 1860 and at this average rate of 32 in a decade, the number of children under 5 in the country to each 1,000 women 16–44 will be as follows:

* In order to reduce the error of the estimates in the earlier decades to a minimum, ages 16–44 were chosen instead of 15–49, the more usual limits.

1920	476
1930	444
1940	412
1950	380
2000	220
2050	60
2060	28
2070	0

The figures indicate that, if changes like those which have been in progress in the United States since 1850 should continue unchecked for a century and a half, there would be no children left. Let me not be understood as predicting a continuance of the movement for any long period in the future. But often the best method of bringing home to ourselves the vast sweep and significance of the changes revealed by statistics is to project them into the future and see whither they lead. No doubt social movements do not occur along straight lines. On the contrary sharp inflections in the curves of social change are frequent. But it is one of the main duties of statistics to point out the trend of the stream along which society is moving and thus perhaps to arouse a desire for a change.

This tendency to a decline in the birth rate is in nowise confined to the United States. On the contrary the movement in most European countries has been in the same direction. In twenty-four European countries, all, except Ireland, Portugal, and Bulgaria, for which the records are at hand, the birth rate 1901–10 was lower than in the preceding decade and in nearly all of them it was lower than in any earlier decade.

In considering the causes of this great change, let me refer first to the position of Herbert Spencer. He has argued that the various organs of the body compete with each other for nourishment and growth, that the surplus not required by the individual is all that can be devoted to the continuance of the race, that no other system makes demands upon the body as heavy as those of the nervous system, that civilization and education are steadily increasing this drain and decreasing the surplus. He finds, therefore, a natural and inevitable connection of a physiological kind between an advancing civilization and a decreasing birth rate. Some students of American statistics have sought to find support for this posi-

tion in our fragmentary and elusive material. I cannot go farther with the question this morning than to express my judgment that these efforts have not been successful and that there is no conclusive evidence, statistical or otherwise, in support of Spencer's contention. While admitting the heavy and increasing demands upon the nervous system made by modern conditions, I would point out that the decreased death rate and the decrease of sickness by which it is probably attended mean an increase of human vitality and so of the surplus to be drawn upon. Whether the increased expenditure on the nervous system equals or exceeds this increased surplus no one has even tried to prove. Until that is done I believe the Spencerian theory must be deemed only a theory.

Nor can we admit, as others have argued, that the decreased birth rate in civilized countries is due either to the growing abuse of alcohol or to the spread of venereal disease. Such arguments have come mainly from special students of these social evils and such students often lose the sense of proportion and find a relief from every social ill in the one reform on which their eyes are riveted.

Walker explained the decrease in the American birth rate by the menace to the American standard of life from the influx of swarms of immigrants accustomed to cheap food and clothing and bad housing and to the effect of this menace upon the birth rate primarily of the native stock and ultimately of the entire population. This explanation is improbable, because the decrease as we have seen began as early as 1810, when immigration was an unimportant influence, and has been matched in Australia, where it must be due to other causes than that assigned by Walker, since Australia has had no great influx of immigrants.

Turning from these inadequate explanations, the true reason for the fall in the birth rate is that in modern times, mainly within the last half century, births and the birth rate have come under the control of human will and choice in a sense and to a degree never before true. Our leading American authority, Dr. John Shaw Billings, put it as follows: "The most important factor in the change is the deliberate and voluntary avoidance or prevention of child-bearing on the part of a

steadily increasing number of married people who prefer to have but few children." Before this change began the birth of a child was, to be sure, the result of normal physiological processes, but in the vast majority of cases the birth itself did not indicate a deliberate preference for that result on the part of both or either of the parents. There is not a single one among the experts who denies that this is the great underlying cause of the modern decline in the birth rate of all civilized countries.

In considering this change may I first suggest that some such change was an almost necessary consequence of the great decline in the death rate? That is, if the death rate in Europe had declined as rapidly as it has and the birth rate had not declined, the population of that continent would now be increasing even faster than the wealth or the food supply. The standard of living would be sinking and we would probably soon relapse into our former ill state. It is the decline in the birth rate, and only that, which has enabled mankind to grip and hold fast the advantages promised by the decline in the death rate.

But there is a very important difference between the two changes. It is probably to the interest of society in the long run that each individual should be given a chance to live out his life to old age, and social effort directed to that end is beneficial both to the individual and to society. Thus far the interests of the two coincide. For this reason the two have coöperated and are coöperating effectively to reduce the death rate. But in the matter of the birth rate there is a lack of adjustment between the interests of society and those of the individual. Society is deeply concerned that enough children should be born to secure its own permanence and a reasonable increase and that those children should have the highest promise of service. The individual is deeply concerned not to compromise his own future by assuming responsibility for wife or family without the prospect of being able to maintain them in accordance with his standard of living. The individual may often see for himself or herself, therefore, a balance of advantage in abstinence from or postponement of marriage, in a childless marriage or a small family, while society from its point of view might conceive it to be most important that a given endowment of much social worth should be perpetuated.

If there were time it would be easy to show that a low and diminishing birth rate is especially characteristic of many strains of population, like college graduates of both sexes and the native American stock of the New England states, stocks perhaps better endowed than the average population with hereditary qualities the perpetuation of which is socially desirable.

While persons engaged in grappling with public health problems should interest themselves in the various changes I have briefly outlined, the main question which my figures raise is this: How shall the desirable natural increase of the population be secured and at the same time the quality of the population be maintained or improved by securing at least a normal or average and, if possible, a more than normal birth rate and natural increase in the strains of population which are of the best stock and therefore likely to transmit qualities of greatest social worth?

In this difficult field a few general principles may be stated dogmatically, which I would be glad to explain and defend, if there were time.

1. The death rate cannot be expected to fall much below where it now stands in healthy districts.

2. There is no such natural limit to a fall in the birth rate.

3. The spread in the volitional control of the birth rate is a change against which, even if we believe it undesirable, it is hopeless to struggle.

4. Legal regulations of marriage in the effort to diminish the number of births of diseased or otherwise undesirable children seem likely, unless accompanied by segregation, to do more harm than good.

5. The social service rendered by parents who have hereditary qualities of great value and make heavy sacrifices in other directions in order to rear families of normal size or larger is likely in future to be much better appreciated and requited.

6. Persons interested in maintaining the numbers and improving the quality of the population should aim not merely or mainly at a continued reduction of the general death rate but also at the gradual education of public opinion towards a readjustment of the birth rate in various classes which will enable society to gain from its best strains more than it can do under present conditions.

STATISTICS OF IMPORTS AND EXPORTS.*

By Frank R. Rutter, *Assistant Chief, Bureau of Foreign and Domestic Commerce.*

The collection of statistics of imports seems a simple task. Dutiable imports must be declared and examined for purposes of revenue. Free imports must be declared and inspected, at least in a cursory way, to make sure that they are entitled to free entry. Even exports, though subject to no duty or tax, must pass through our ports or our customs districts on the land frontier, and it is obviously easier to take a count of goods passing a given point than to count them at the numerous points of production or manufacture.

The problems involved in the collection of commercial statistics are doubtless simpler in many respects than those met in the field of census statistics, labor statistics, and crop estimates. It is not necessary to go to the man, as in the enumeration of the population, or to the factory, as in the census of manufactures; nor is it necessary to make sure that the returns obtained from a few selected observers are typical of crop conditions throughout the country. Yet there is a serious problem in import and export statistics—a problem quite distinct from those in other branches of statistics and one that has not received from American statisticians the attention that it deserves.

Customs control does not, even in the case of dutiable imports, afford an adequate check of accuracy. The primary duty of customs officers to attend to questions of revenue unavoidably and unconsciously diverts their attention from statistical requirements. Commercial statistics have been described as a customs by-product. This phrase aptly brings out the subordinate part that statistics play in the customs service. A statistical check, entirely separate from the check on the duties, is needed all along the line.

It will probably conduce to clearness to point out three familiar differences between the statistical system of Great Britain

* Paper presented at the annual meeting of the American Statistical Association, Washington, D. C., December 29, 1915.

and of the leading Continental nations. There is, first of all, a distinction between "special" and "general" commerce in the statistics of Continental countries that applies equally to imports and exports. In theory an article enters "general" commerce when it crosses the frontier; in practice the meaning is somewhat contracted, since most countries exclude, even from this most extended category, the direct transit trade and the transshipment trade. "Special" commerce, on the other hand, covers only that part of the "general" commerce that the country carries on on its own account. In "special" exports only goods that are produced within the country are included, and in "special" imports only goods intended, so far as the customs records disclose the facts, for consumption within the country. "Special" commerce, therefore, measures with varying degrees of success the importance of the country as a producer and consumer of goods, while "general" commerce measures the importance of the country as a trading nation.

In Great Britain, as in this country, the distinction is made more directly, but less logically. British exports are divided into "British goods" and "foreign or colonial goods"—just as we divide exports into "domestic exports" and "foreign exports." To obtain the total of the "general" exports according to the Continental method, these two classes must be added together. On the import side, British and American practice approaches more closely the Continental; goods become "imports" as soon as they cross the frontier, but do not become "imports for consumption" until they are released from customs control and are free to circulate throughout the country.

A second point of difference is the greater emphasis placed on the distinction between free and dutiable goods in the British and American statistics than in the Continental. Doubtless many members of this Association have been surprised and annoyed to find that it is difficult, if not impossible, to ascertain from the commercial statistics of many Continental countries the amount of duty collected on a given article or group of articles. The point may seem to be of too little consequence to mention; it is important, I take it, because it

illustrates the official view of statistics still prevailing here and in Great Britain, as contrasted with the commercial view of statistics on the Continent. In our statistics every article has been marked "free" or "dutiable" throughout the tables of imports for consumption, imports, and (prior to July 1, 1915) foreign exports. Aside from the imports for consumption, this distinction seems of no real commercial importance, and in the case of foreign exports it is confusing and, at times of tariff change, actually misleading.

The third and most important point of difference between British and Continental statistics is the requirement of a declaration of value, as well as quantity, by the British customs. Values, both of imports and exports, must be declared by the importer and shipper in all cases here as well as in Great Britain, while on the Continent it is sufficient in most cases for the importer or shipper to declare the quantity, from which the value is calculated annually (or more frequently) by means of average values. There has been some tendency, at least in Germany, towards the system of declared values. In 1909 the number of items for which value as well as quantity must be declared before the customs was increased from 144 to 1,364 in the exports and from 18 to 32 in the imports. The larger use of the ad valorem duty in this country and until recently in Great Britain and the larger use of the specific duty on the Continent is undoubtedly responsible for the varying emphasis laid on value and quantity in commercial statistics.

LEGAL BASIS FOR STATISTICS.

Our statistical system is derived from the old British system. On the import side the requirements have to do primarily with the collection of revenue, and statistical returns are obtained incidentally. At first, an entry was the only formal document required, but this was soon supplemented by compelling the importer to produce a commercial invoice as evidence of the accuracy of his entry. By law of July 14, 1862, the invoice must be certified by an American consular officer.

The legal basis of our system of export statistics dates from 1820. In that year a law was passed requiring shippers to present manifests showing the quantity and value of their

goods but imposing no penalty upon them for failure to comply with the law. The master of the exporting vessel was likewise required to present a manifest for the whole cargo showing much the same data. If he failed to comply with this requirement clearance might be refused and if he sailed without clearance he was liable to a penalty of $500.

This system doubtless worked well when the ship master had personal knowledge of the cargo carried. He was then in a position to check the accuracy of the shippers' statements.

Under modern conditions this system does not work. The master of the vessel no longer knows the cargo. Neither he nor the agent of the line can verify the statements of the shippers. His statement of value merely reproduces the statements of the shippers and affords no test of accuracy. From a port like New York where most of the exports are shipped in liners, the vessel must sail on schedule time and an element of haste is introduced that renders it difficult, if not impossible, even to make sure that all shippers' manifests have been furnished.

It is therefore not strange that at our large ports vessels have been permitted to clear without presenting the papers required by law, on the assurance that a complete manifest would be furnished within four days after sailing. Shippers' manifests are frequently missing, yet the penalty is not imposed on the master of the vessel, doubtless because it is recognized that the fault is not primarily his but the shippers'.

At best the system had to do only with exportation by water. With the growth of railroads exports by land to Canada and Mexico assumed large volume, and prior to 1891 were very inadequately returned. In that year a law was passed requiring shippers' manifests and car manifests based in part on the regulations concerning exportation by water. A new law was enacted in 1893 which still regulates shipments to foreign countries by land.

While the shipper by vessel has in a great majority of cases a representative at the seaport, the exporter by rail has no agent at the land frontier. As a result the declaration had to be prepared by the interior shipper and the only practical way of transmitting the declaration to the collector of customs was

by entrusting it to the railroad company. The penalty for failure to present a manifest was not applied to the shipper but (in the amount of $50) to the agent of the railroad company who carried out of our jurisdiction goods not accompanied by a manifest.

The effect of the change in law is reflected in the exports through Buffalo to Canada. From less than $500,000 in 1890 the figures jumped to over $4,000,000 in 1895.

The next important change in law was the extension of the requirements in the case of exports by vessel to shipments to non-contiguous territory. This took place in 1902, after the effort to collect returns without due authority of law had been proved impossible.

EFFORTS TOWARD IMPROVEMENT.

For many years it has been realized that the method employed in collecting both import and export statistics needed a thorough revision. Departmental and inter-departmental committees have investigated the subject and have made illuminating reports and presented recommendations. Two committees—one of Treasury officials headed by Mr. N. I. Stone, and one of officials of the Department of Commerce and Labor, headed by Mr. E. Dana Durand—were appointed in 1911, and made a thorough investigation of the subject.

The chief complaints from business men are concerned with the lack of fullness and timeliness in statistical publications. The lack of accuracy in statistics of imports, as well as exports, is not generally realized, yet this is the fundamental defect and gain along this line must precede any elaboration of the present classification. There are five lines along which improvement is needed: (1) Accuracy; (2) timeliness; (3) classification; (4) presentation of results; (5) comparability.

ACCURACY OF IMPORTS.

Among the public there is now a false sense of security in the correctness of import and export returns, because they constitute a by-product of customs administration. Customs officials, however, in their zeal to safeguard the revenue are

prone to allow their attention to be diverted from those statistical data that do not directly affect the amount of import duty. There is considerable error in the statistics of dutiable imports; more in the statistics of free imports; and most of all in the statistics of exports.

At the same time it is believed that the present extent of error in import statistics has been exaggerated. The results of the test made by the former statistical committees covering transactions at New York for one week in August, 1910, have been described as "appalling." The two sets of figures then obtained were tabulated respectively from the "entry" and from the "liquidated returns." The first of these tabulations represented the facts disclosed by the entry as submitted by the importer or customs broker; it did not represent the statistics as corrected for obvious errors by the statistical office of the customhouse. On the other hand, the so-called "liquidated returns" represented not merely the changes made on the entry by the liquidation clerks, but involved a careful reëxamination of the invoice. The basis of the comparison, therefore, was between returns on the one hand less accurate than those actually compiled, and on the other hand returns more accurate than could be compiled from the entry alone, even after liquidation. The old test, however, served a most useful purpose. It brought out clearly the substantial inaccuracy of our import statistics, and, in particular, of statistics more detailed than the tariff calls for. And it brought to statistical clerks in the customhouses a wholesome distrust of the unverified statements of importers and exporters.

There is imperative need of a new test. The larger use of ad valorem duties under the present tariff necessitates more frequent consultation of the invoice since a statement of quantity, which no longer affects the amount of duty, is often omitted. Strong representations have been made recommending a new test at New York, but the unusual pressure of work due in part to the increase in exports, and in part to the efforts toward perfecting the system of mechanical tabulation, have up to the present prevented the test.

It is, however, already known that the chief errors in import statistics result from inadequate detail in the entry, and failure

to take account of corrections made by the appraiser and weigher. The first of these errors is due to lack of a statistical examination of the entry before it is accepted. The examination of the entry is a hurried one and is made by clerks more familiar with the tariff than with the statistical classification. It is, therefore, entirely natural that they should give first attention to factors that affect the revenue. The remedy, as pointed out by the Statistical Committees of 1911, is to provide a separate statistical examination of the entry. While plans are being made to put this reform into practice, it is being postponed, in part for administrative reasons and in part to await the full operation of the new export regulations.*

Whether or not the changes made in liquidation are of sufficient importance to be incorporated in the statistics of a following month has not yet been determined. Liquidated returns are used for statistical compilation in most of the minor ports, but not at New York, Boston, Philadelphia, Baltimore, New Orleans, or Chicago. At New York, liquidation is always from three weeks to six weeks, or even longer, in arrears; the change would therefore have to be made in a subsequent month; and in most cases the statistical changes noted on the entry by the liquidator are not material.

As an ideal, returns should be compiled from the invoice after appraisement. The invoice, however, is a cumbrous document, describing each lot, and sometimes each parcel, in minute detail, and usually with values in a foreign currency. The entry, on the other hand, is a summary of the invoice, and is a far more convenient document from which to compile statistics. For convenience and economy, therefore, it must be the document used, and it can be made a safe guide if the proper statistical examination is made before its acceptance.

ACCURACY OF EXPORTS.

Defects in the statistics of exports may be ascribed chiefly to lack of appropriate penalties to insure a declaration for each shipment. The present law is archaic, penalizing the vessel rather than the shipper who fails to fulfill the legal require-

* Since this paper was written, some entry clerks at New York have been designated to examine every entry for statistical details.

ment. It is most desirable also to have the original shipper, who best knows the facts, make the declaration.

The Committees of 1911 recommended a law compelling the original shipper, if in the interior, to present with the goods a declaration to be forwarded by the common carrier to the seaport, and there delivered to the Collector of Customs. Penalties were provided alike on the shipper who failed to present the declaration and on the carrier who accepted a shipment for export without the declaration. The purpose of the bill was excellent, but its provisions, in my judgment, were too drastic. It has long been known that for many shipments, especially from New York, no declaration has been presented, and, consequently, that the goods are omitted from our record. Last spring efforts were begun, both by the Statistical Bureau of the New York Customhouse and by the Marine Division, to notify delinquent shippers that declarations must be presented. Much improvement resulted, but this practice is merely a makeshift.

A more serious effort to accomplish as much as possible by administrative action was made in September, 1915, when the Secretary of the Treasury and the Acting Secretary of Commerce issued new export regulations (T. D. 35708). The purpose of the new regulations is to compel the presentation of a declaration, preferably from the original shipper, for every export shipment. A vessel is not to be allowed to clear until declarations from all shippers have been presented to the Collector of Customs at the port of exportation. In the absence of any declarations, the vessel may clear only if it gives bond to furnish within fifteen days all the missing declarations. The bond is in the sum of $500, and of this amount $50 is to be deducted for each declaration not presented within the fifteen days allowed. The regulations aroused a storm of protest and in some minor respects they were amended by order of the Secretary of the Treasury and the Secretary of Commerce on December 14, 1915 (T. D. 35969), and the date on which they became effective was postponed from January 1 to February 1, 1916. In the revised draft less insistence is placed upon the requirement that the original shipper make out his own declaration. If properly

authorized, an agent at the seaboard may perform this task. The essential thing is the responsibility of the shipper himself, and the presentation of a proper declaration.

I am in hopes that much will be accomplished by the new order. I am inclined to think, however, that it could be accomplished more easily and more satisfactorily by a new law imposing on the shipper moderate penalties: (a) For failure to file a declaration; (b) for incorrect declaration; and (c) for failure to show the necessary statistical details. This measure should contain a provision authorizing the Collector of Customs to call for the original invoice in all cases to determine whether or not the declaration is correct.

TIMELINESS.

Timeliness is the first essential, in the view of the average business man. The importance of this factor is, of course, greatest in the case of monthly statistics. Yet for the last year there has been greater delay in the publication of the "Monthly Summary of Foreign Commerce," while the annual reports are being printed more promptly than in the past. The worst record is that for October. The last statement required for the compilation of the October issue was not received by the Bureau of Foreign and Domestic Commerce until December 15, more than six weeks after the close of the month. The war is largely responsible for the delay in the receipt of monthly returns from the Collectors of Customs. Their statistical forces are in many cases not flexible and the number of men compiling the export returns has not been sufficient to keep abreast of the great increase in the number of export transactions.

The special effort to publish returns more promptly has, in itself, been a source of delay. The installation of mechanical tabulation seemed to offer the best means of expediting the returns without increasing the expenditure for statistical work. Since July 1, two sets of returns have been compiled in the various customhouses, one for transmission daily to the New York Customhouse for mechanical tabulation, and the other serving as the basis for the monthly returns to the Bureau of Foreign and Domestic Commerce. Obviously, the double tabulation

has caused delay, yet this was unavoidable since, as experience has proved, reliance could not be placed from the start on the results compiled on the tabulating machines.

The new system offers at least three advantages. The first, perhaps obvious, is the receipt of prompter returns from the customhouses. The gain will probably be found, when the new system is perfected, rather in the more prompt tabulation of the returns when the month is over than in the saving of time in the original compilation.

The second advantage to be derived from the use of tabulating machines is the elimination of much purely clerical labor—and the gain from this will be found chiefly in the more careful scrutiny of the returns that will be made possible. It is imperative to insist that the clerks relieved from clerical drudgery shall be so employed as to lessen the element of error in commercial statistics rather than to effect a smaller expenditure for statistical work. Accuracy is largely the reward of adequate care and labor, and much of the error that has crept into statistics in the past is the result of an insufficient statistical force in the customhouses.

The third advantage from the new system is its greater elasticity, and the consequent ease with which additional details can be compiled. The labor involved in increasing the classification when the returns are tabulated mechanically is far less than when compiled in blotters. The number of cards determines the time required for mechanical tabulation, and the number of cards does not increase proportionately to the number of items in the classification.

Up to the present, the results obtained by mechanical tabulation have been disappointing. It is not known whether this is due to inadequate equipment, to a lack of proper checks as to accuracy, or to a failure on the part of the New York officials to realize fully the data required by the Bureau of Foreign and Domestic Commerce. It is hoped that the difficulties can soon be overcome, for mechanical tabulation seems to be the most practical means of increasing the timeliness of our publications without sacrificing important details.*

* Substantial progress has been made since this paper was written, through closer coöperation between the Bureau and the customs officials.

CLASSIFICATION.

With the increasing use of commercial statistics by business men, great emphasis is placed upon the need of specific information. To be of value, returns must be given in greater detail. The business man is interested in a particular line, and finds of little or no help returns that combine his products with those of several related lines. With every increase in the classification, there is greater liability to error. The entry that describes merchandise sufficiently to determine the proper rate of duty is likely to be passed, even though the statistical sub-class is not shown. Many of the errors disclosed by the former test were due to this cause. In the interest of accuracy, therefore, it is out of the question to expand materially the import classification until provision is made for a preliminary statistical comparison of the entry with the invoice.

The greatest need for an expansion of the classification is found in the case of exports. The most detailed classification of exports now covers less than 600 items, while in the imports for consumption there are about 3,000 distinct items. The chief preventive of an increase in the number of items is the indefinite character of export declarations. So many articles are described merely by general terms that it is out of the question to separate articles frequently of much commercial importance.

Defects in the present classification, aside from its incompleteness, are the incomparability of the import and export schedules and the failure to conform to current commercial terms. The latter defect is due to the preservation in the tariff of many terms now obsolete, and the necessity of having the statistical classes follow closely the tariff items.

The whole subject of classification demands most careful investigation and the Bureau is planning to undertake this task in coöperation with commercial organizations throughout the country, as soon as the success of mechanical tabulation is assured. It is apparent that it would be unwise to study this question until the limits fixed under the new system can be ascertained.

PRESENTATION OF RESULTS.

The best method of presenting statistical results is particularly a subject on which the advice of this Association would be of the greatest value. Statistical reports continue too long to follow the same form after the conditions that first determined that form have passed away.

The statistical year is still the fiscal year extending from July 1 to June 30. This seems a relic from the period when commercial statistics were instituted for the information of the government. Now that they are no longer regarded as solely or even chiefly of interest to official classes, the period to which they relate should be that most convenient and least confusing to the public.

The business year differs greatly from industry to industry and even from establishment to establishment. So far as I have been able to ascertain, the calendar year, more largely than any other, is used for business accounts. This practice has been intensified since the enactment of the income tax. Census returns of manufactures are collected chiefly for the calendar year. The calendar year is the period for which commercial statistics of most foreign countries are published. The use of any other period tends to confusion since it is impossible in all references to describe the period as "year ending June 30."

It may be urged in favor of the present fiscal year as a period for commercial statistics that it coincides more nearly than the calendar year with the natural or crop year. The returns of wheat exported during the year ending June 30, 1915, for example, cover approximately the crop harvested in 1914, while on the calendar year basis exports from that crop would be divided over two distinct years. With the increasing industrial character of the United States, however, this consideration becomes of less and less importance. The great users of commercial statistics are the manufacturers and traders rather than the farmers. It would always be desirable, I take it, to include in the introduction or as an appendix to the annual statistical report a statement by fiscal years, or better by crop years, of the trade in several of our staple crops.

The gain in clearness and in comparability with census statistics and foreign commercial statistics is sufficient in my judgment to render a change to the calendar year highly desirable. To effect this a change in law is necessary.

What is generally understood by the term "imports"? Legally, an article is imported when landed, whether for immediate consumption or for storage in bonded warehouses. From an economic point of view, however, bonded warehouses may well be regarded as foreign territory. The door of the bonded warehouse is really the economic frontier of the country.

Since the United States is not a large reëxporting country, the difference between "imports" and "imports for consumption" is largely one of time. The instances in which goods are exported from warehouses are few as compared with the instances in which after the lapse of time goods are entered for consumption within the country.

Perhaps the distinction is most clearly brought out by an illustration. While the last tariff act was under discussion wool in large quantities was landed at our ports and stored in bonded warehouses until December 1, 1914, when it could be withdrawn without payment of duty. Was such wool really imported when it was landed or when it was removed from the warehouse?

On the export side we have a clear distinction between domestic exports and foreign exports. On the import side imports for consumption are most nearly comparable with domestic exports, yet not fully comparable, since free goods are not generally warehoused and may be entered for consumption although intended for reëxportation. To be strictly accurate, dutiable imports for consumption should be compared with domestic exports and free imports with domestic and foreign exports combined.

I am in favor of adopting as the basis for the statement by countries imports for consumption instead of imports—first, because imports for consumption correspond more closely to the economic concept of imports; secondly, because they are more comparable, at least in the case of dutiable goods, with domestic exports; thirdly, to facilitate comparison with

foreign statistics; and last, to avoid the confusion resulting from two sets of returns, the distinction between which is not generally understood, while the difference in most cases is too small to have any real significance.

How far is it desirable to continue the distinction between "free" and "dutiable" imports and foreign exports? In the case of foreign exports, it can be of no interest to the reader to know that any particular article would be free or would be dutiable if it were imported. At a time of tariff change, the distinction is really confusing. If "free foreign exports" means anything to the reader, it means that the article shipped abroad was admitted free when it was imported. Yet an article subject to duty when imported under a preceding tariff would be recorded as free if reëxported after the article had been transferred to the free list.

The distinction seems of little value even in the case of imports by countries. In a country statement, the reader is interested in knowing the commercial movement of the article irrespective of its tariff treatment. The reader would find more convenient, I am sure, a statement of flax imported for the whole of the fiscal year 1914, than the two statements published in Commerce and Navigation showing the imports separately under the Payne-Aldrich and the Underwood Acts.

The detailed statement of imports for consumption shows not only whether articles are free or dutiable, but the rate and amount of duty on each item. This one table seems sufficient for showing the tariff treatment of goods. To lump together free articles and articles dutiable at 5 per cent. seems no worse than to group articles dutiable at 5 per cent. and 100 per cent.

As far, however, as the Bureau has felt justified in going, is to eliminate the distinction in foreign exports. This was done on July 1, 1915. If approved by appropriate Congressional committees, by business organizations, and by leading statisticians, the distinction will be discontinued likewise in the monthly returns and in the statement by countries in the annual report.

Is the basis of valuation for imports correct? This country stands with a minority of the leading nations in showing the

value in the chief markets of the foreign country where purchased. Freights, commissions, and other non-dutiable charges are excluded. As a result, our valuations are not comparable with those in the United Kingdom and most other European countries where both exports and imports are valued at the national boundary.

Perhaps the most striking instance of the unfortunate result of our method of valuation is seen in the import prices of rubber. Notwithstanding the improvement of plantation rubber, Para rubber is still quoted at a slightly higher price. In Brazil, however, there is a heavy export duty, which constitutes an important element in the price. This duty is not included in our statistical valuation with the result that the value of India rubber imported from Brazil during the fiscal year 1914 averaged only 40 cents a pound, while the import value of that from Ceylon averaged 60 cents a pound.

From a statistical point of view, the valuations should represent the value at the frontier—in the case of exports, f. o. b. values, in the case of imports, c. i. f. values. The change suggested, however, can not be effected without grave inconvenience so long as our ad valorem duties continue to be based on foreign values.

COMPARABILITY OF STATISTICS.*

That the statistics of foreign trade of different countries are far from being comparable is generally recognized, but few realize the extent to which such incomparability exists. Four of the causes responsible for this condition are: (1) Varying definitions of the terms "imports" and "exports"; (2) different methods of determining weight and value; (3) inaccurate declaration of origin and destination; and (4) differences in classification.

Varying Definition of "Imports" and "Exports." Attention has already been called to the distinction in most continental countries between "special commerce" and "general commerce." International comparisons are usually based on "special" imports and exports. Discrepancy is often caused

* The discussion of international statistical comparisons is based on my report on Uniform Classification of Merchandise, published by the International High Commission, Pan-American Financial Conference, 1915.

by the inclusion in some countries of imports of raw materials for reëxportation in manufactured form, and similarly by the inclusion on the export side of the articles so manufactured and reëxported, while other countries exclude both these classes.

Different Methods of Determining Weight and Value. While in general the weight shown statistically is intended to represent net weight, there are numerous exceptions to this rule. In the case of value the resultant discrepancies in commercial statistics are much more apparent. In the majority of countries the effort is made to show the value of exports when they leave the country and the value of imports when they reach the customs frontier, inclusive of freight and insurance, but exclusive of import duty. The United States is an exception since, in the case of imports, the foreign value (f. o. b. port of lading) instead of the value on arrival (c. i. f.) is prescribed by law. Freight charges are not, as a rule, sufficient to cause a marked discrepancy, but the exclusion of certain non-dutiable charges, such as export duties in the country of origin make our statistics of, say, imports of Brazilian rubber incomparable in point of value with the British statistics of imports of the same commodity.

Inaccurate Declaration of Country. The exports of raw cotton from the United States to Germany in the calendar year 1913, according to our own returns, amounted to 1,000,000 bales more than the German returns record. Russia, on the other hand, credits this country with more than twice the amount that our statistics show. The large transshipment trade through the free port of Hamburg and other German ports explains the first of these discrepancies. Shipments declared for Hamburg, without indication of any further destination, are of necessity recorded in our returns as exported to Germany, while in the German returns only the cotton entered for consumption is recorded. In the case of Russia, the reason for the discrepancy is much the same. Our commercial relations with that country are largely indirect, and as a result large quantities of American cotton for Russian consumption are shipped through other European ports, largely for account of firms located in such ports. Such ship-

ments have to be recorded in our returns as exported to the countries in which the transshipment ports are located. If in the Russian returns all the cotton imported could be traced back to its country of origin, the discrepancy would undoubtedly be much larger.

As a general rule, import statistics are more trustworthy than export statistics. In the case of exports, the ultimate destination of the goods is frequently unknown; while in the case of imports the country of origin, although sometimes difficult to trace, can usually be ascertained if sufficient effort is made.

Differences in Classification. The primary basis of classification is sometimes found in the origin of the product or its degree of manufacture, as in France; sometimes, as in most South American countries, the raw materials and their various manufactured forms are grouped together in great classes, such as "textiles"; sometimes, as in Germany, both these divisions are made; sometimes the articles are arranged in alphabetical order. The component material determines the classification of articles in some tariffs, while in others regard is had to the use of the article. Commercial statistics follow the tariff in practically all countries and follow it slavishly where commercial interests are not sufficiently organized to demand additional details. Statistical classification is so intricate and so varied that international comparisons are often impossible and always liable to error.

A most striking illustration of apparent discrepancy in statistics due to differences in classification is found in the shipments of pumps from the United States to Cuba. In the fiscal year ending June 30, 1914, the American returns recorded a value of $291,350 for "pumps and pumping machinery" destined to Cuba; while the Cuban returns show imports from the United States of pumps worth only $19,631.

A careful examination of the Cuban tariff and customs decisions brings out clearly the reason for the apparent discrepancy between the two sets of statistics. The item described as "pumps" in the Cuban statistics doubtless refers to the phrase "steam pumps" in tariff No. 218. But even those, if intended for use on farms or in sugar factories, are

admitted at greatly reduced rates of duty under the head of "Agricultural machinery and implements" (No. 216) or "Machinery and implements for sugar plantations" (No. 215). The vast majority of the pumps imported are undoubtedly declared for customs purposes under one of these two classes and appear under the corresponding item in the statistics. Pumps other than steam pumps not intended for use on farms or plantations are classified for duty purposes, and undoubtedly for statistical purposes, under tariff No. 226, "Machinery and apparatus not specified."

This instance should not be construed as reflecting in any manner on the accuracy of the Cuban returns. Without doubt numerous cases could be found in the statistics of the United States, where, owing to differences in classification, some articles would appear to be understated in comparison with the returns of other countries. The illustration from the Cuban statistics has been cited merely to emphasize the need of greater uniformity in classification, if general readers are not to be misled.

The adoption of a uniform classification would do much to make the statistics of different countries more comparable.

As far back as 1869, the International Statistical Congress advocated uniform classification. The International Customs Conference held in Paris in 1900 went carefully into the subject, and recommended that the various countries unite on a common statistical classification to cover only the most important articles, which would serve as a basis for international statistics, in addition to the ordinary statistics published by each country, according to its own classification. The International Statistical Conference of 1910 at Brussels drew up a tentative classification for this purpose, which was referred to the various governments represented for further consideration. With few amendments, this classification was adopted by the International Statistical Conference of 1913 at Brussels and incorporated in a convention, instituting the International Bureau of Commercial Statistics and providing for the annual publication by that bureau of the imports and exports of each of the contracting countries. The United States was not represented officially at these conferences.

The first step had thus been taken toward statistical uniformity when the European war broke out. It is to be hoped that upon the conclusion of peace the convention will be renewed.

CONCLUSION.

I have aimed in this paper to bring clearly before you the fact that a serious problem, worthy of your most careful consideration, is involved in commercial statistics. I have pointed out some of the differences between the British system, which we inherited, and the system on the Continent. For greater accuracy in respect to exports, more stringent regulations have recently been prescribed. Greater accuracy in imports can best be obtained by a preliminary statistical comparison of the entry with the invoice. Timeliness and fullness of detail are of great importance; means of improvement along these lines are now being worked out. In the presentation of results, I am in favor of adopting the calendar year as the statistical period, of showing by countries imports for consumption instead of general imports, and of discontinuing the distinction between free and dutiable goods except in the detailed statement of imports for consumption. To lessen the serious incomparability that exists between the commercial statistics of different countries, the first step has been marked by the establishment of the International Bureau of Commercial Statistics at Brussels, which unfortunately was prevented from starting its work by the outbreak of the war.

THE MORTALITY OF OUR PUBLIC MEN.

Being a Study of the Mortality of the Presidents, Vice Presidents, Senators and Representatives, of the United States Compared, with Insured Lives, and Others.*

By Irving Fisher, *Professor of Political Economy, Yale University. Chairman of the Hygiene Reference Board of the Life Extension Institute.*

This paper is primarily a study of the mortality of the Senators and Representatives of the United States. As preliminary to this study, however, we first record the facts as to the longevity of the Presidents and Vice Presidents of the United States. The number of cases in the last two groups is too few, of course, to enable us to make any safe statistical generalizations. The following table gives the facts individually as to our Presidents:

LONGEVITY OF PRESIDENTS.

(1) Name.	(2) Date of First Inaug.	(3) Years Served.	(4) Age of President when Inaug. (to Nearest Year).	(5) Actual Years Lived from Inaug. to Death (to Nearest Year)	(6) Expectation of Life at Inaug. (Amer. Exper. Table) (a).	(7) Ratio of Actual to Expectation. (5) ÷ (6) Per Cent.
Washington	Apr. 1789	7 5/6	57	11	16	69
J. Adams	Mar. 1797	4	61	29	13	223
Jefferson	Mar. 1801	8	58	25	15	167
Madison	Mar. 1809	8	58	27	15	180
Monroe	Mar. 1817	8	59	14	15	93
J. Q. Adams	Mar. 1825	4	58	23	15	153
Jackson	Mar. 1829	8	62	16	13	123
Van Buren	Mar. 1837	4	54	25	18	139
Harrison	Mar. 1841	1/12	68	1/12	9	1
Tyler	Apr. 1841	3 11/12	51	21	20	105
Polk	Mar. 1845	4	49	4	22	18
Taylor	Mar. 1849	1 1/3	64	1	12	8
Fillmore	July 1850	2 2/3	51	24	20	120
Pierce	Mar. 1853	4	48	16	22	73
Buchanan	Mar. 1857	4	66	11	11	100
Lincoln	Mar. 1861	4 1/12	52	4	19	21
Johnson	Apr. 1865	3 11/12	56	10	17	59
Grant	Mar. 1869	8	47	16	23	70
Hayes	Mar. 1877	4	54	16	18	89
Garfield	Mar. 1881	1/2	49	1/2	22	2
Arthur	Sept. 1881	3 1/2	51	5	20	25
Cleveland	Mar. 1885	8	48	23	22	105
B. Harrison	Mar. 1889	4	56	12	17	71
McKinley	Mar. 1897	4 1/2	54	4	18	22
Roosevelt	Sept. 1901	7 1/2	43	living	living	
Taft	Mar. 1909	4	51	living	living	
Wilson	Mar. 1913		56	living	living	

(a) The "American Experience table of mortality" was first published in 1868. It was constructed by Sheppard Homans, principally from the experience of the Mutual Life Insurance Co. of New York. It has been, for a long time, the common standard for life insurance companies' calculations and for statistical comparisons, although it represents a heavier mortality than that of present insurance experience.

* Paper presented at the annual meeting of the American Statistical Association, Washington, D. C., December 29, 1915.

The longevity of each President is reckoned from the date of inauguration—that is, from the time of his first *being* President. Thus Washington became President at 57 years of age when the "expectation" of life, according to the American Experience table, was 16 years. He actually lived, however, only 11 years instead of the 16. That is, he lived only 11/16, or 69 per cent., of his expectation. John Adams, on the other hand, lived after inauguration 29 years, which was 2.23 times his expectation of 13 years.

Greatest Longevity.	Least Longevity.
John Adams (223)	Harrison (the first) (1)
Madison (180)	Garfield (2)
Jefferson (167)	Taylor (8)
J. Q. Adams (153)	Polk (18)
Van Buren (139)	Lincoln (21)
Jackson (123)	McKinley (22)
Fillmore (120)	Arthur (25)

The long-lived Presidents all belonged to the first half of the list and the majority of the short-lived ones belonged to the second half. These include the three assassinated Presidents, Lincoln, Garfield, and McKinley. If we group these deceased Presidents under four successive periods, approximately equal, we have the following table in which the Vice Presidents are also included:

RATIO (PER CENT.) OF ACTUAL TO EXPECTED LONGEVITY BEYOND INAUGURATION.

	Of all Deceased.		Excluding Assassinated Presidents among Presidents; and Omitting Vice Presidents Who Became Presidents among Vice Presidents.	
Periods.	Presidents.	Vice Presidents.	Presidents.	Vice Presidents.
1st period (4 Pres.—5 V. P.)....	156	137	156	100
2d period (8 Pres.—7 V. P.).....	84	94	84	76
3d period (7 Pres.—7 V. P.).....	75	67	84	69
4th period (5 Pres.—5 V. P.)....	45	42	68	44
Total.....	82	84	93	70

The table shows that the longevity of our Presidents, omitting the three still living, is only 82 per cent. of that

"expected" according to the table, which, in turn, is less than that among insured lives of the present time. Even if we omit the assassinated Presidents, Lincoln, Garfield, and McKinley, the longevity of the remainder is still only 93 per cent. of that expected by the American Experience table and less than two thirds the expectation of the insured lives of today. We note also that the longevity of our Presidents seems to be diminishing with the increasing complexity of modern life in Washington. Their average longevity in the four successive periods was 156, 84, 75, and 45 per cent. respectively, or, omitting the assassinated Presidents, 156, 84, 84, and 68 per cent. We find the same apparent tendency among the Vice Presidents. It is also interesting to note that the Vice Presidents seem to live out a smaller fraction of their expectations than the Presidents, excluding the influence of assassinations. This fact (if it be a significant fact rather than an accidental incident in so small a number of lives) would suggest that the official social and convivial life at Washington is a greater life-shortener than the heavy responsibilities of office.

The five Presidents of Yale University, for substantially the same period as that of the above table, show a longevity equal to 137 per cent. of their expectations. The consistent conformity of all the results to the hypothesis that a "simple" life is a long life and that a "complex" life is a short one is at least striking.

But as already emphasized, the number of lives in all three lists (only 50 in all excluding duplications) is so small that any statistical conclusions whatever, without confirmatory evidence, would be dangerous.

We turn now from these preliminary remarks on Presidential and Vice Presidential lives to the lives of our Congressmen—Senators and Representatives. Here, fortunately, we have enough lives, about 7,500, to make the results of undoubted significance.

In this study I have been fortunate in having the assistance of the New York Life Insurance Company to which I am indebted for its courtesy in permitting the clerical work to be done in its offices. I am also greatly indebted to Mr. Arthur

Hunter, its Actuary, for his assistance and criticism at every stage of the work.

The method employed has not been that of expected longevity used above, but that of expected mortality. This makes it possible to include the influence of the several thousand lives of the Congressmen still living. The mortality of the American Experience table was used here also as a standard of comparison, or measuring rod. Although, as already stated, this early table does not agree with the mortality experienced at present, either by the insurance companies of today* or among the general public, it still serves as a convenient basis in terms of which any actual mortality may be expressed in percentages.†

The chief data for this investigation were obtained from the Biographical Congressional Directory, and the necessary facts relating to nearly 7,500 Congressmen were entered upon individual cards. As the Congressional year dates from March 4, it was found convenient to carry the observations up to March 3, 1912, at which point they were closed.‡

In order to discover the effect of Congressional life on mortality, the following table was constructed:

* Modern experience averages about 25 per cent. less than the American Experience table. The contrast is more marked for the earlier than for the older ages.

† Thus if (for a particular year of age) the actual death rate is half the death rate expected (for that particular year of age) according to the American Experience table, and if the same were true for each other year of age, we would say that the actual mortality is half of the expected. Usually, of course, the ratios of actual to expected death rates will be somewhat different for different years of age. In that case an average of the different ratios, duly weighted, is struck. To take a specific example, we find that out of 398 Congressmen (entering the 15 Congresses ending March 3, 1911 and being 45 to 49 years of age on entering), the *actual* number who died in the second year after entering was 7 and the number *expected* to die out of 398 was, according to the American Experience table, 4.94. Therefore the ratio of actual to expected deaths (in this second year) was 7÷4.94=1.41, or 141 per cent. In the same way, the number actually dying in the tenth year out of 275 then surviving was 3 as against 5.47 expected out of 275. The ratio of actual to expected is, in this case, 3÷5.47, or 55 per cent. In this same way the actual and expected deaths are taken, not only for the second and tenth years, but for each year involved, until all have passed from observation (either by death or by surviving to March 3, 1912, at which date all observations closed). The average ratio for all these years is then found by dividing the total deaths (159) by the total of the expected (137), giving 159÷137=1.16, or 116 per cent., as the ratio of actual to expected for the group of Congressmen in the entire category considered.

‡ Except for the cases mentioned below, where the record was not complete, the investigation covered the entire history from date of entering Congress until death, or until March 3, 1912. The date of birth was required in order to determine the age on first entering Congress. For some Congressmen this information was not given in the Directory. The number of such cases was small (785) and sufficient accuracy was obtained by assuming that they entered at an average age. In other cases the Directory did not trace the history of the Congressman after his retirement from Congress. These cases were not large in number and were included in the investigation from the date of first entering Congress to the date of last retirement from Congress.

SHOWING THE MORTALITY SOON AFTER ENTERING CONGRESS AND LATER, DIVIDED IN ALL INTO FIVE PERIODS OF LIFE, NAMELY, A PERIOD OF TWO YEARS COVERING THE (FIRST) CONGRESSIONAL TERM; A PERIOD OF EIGHT YEARS; THE SECOND DECADE AFTER ENTERING; THE THIRD DECADE; AND THE REMAINDER OF LIFE.

(All Congresses, ending March 3, 1911.)

Number of Years Elapsed Since First Entering Congress.	Actual Deaths.	Expected Deaths.	Ratio of Actual to Expected Deaths. Per Cent.
1- 2	114	194.78	59
3-10	824	833.76	99
11-20	1,329	1,247.84	107
21-30	1,360	1,344.67	101
31 and over	1,506	2,028.62	74

The above table shows strikingly that Congressmen had a low mortality immediately after entering Congress, but a greatly increased mortality as the years passed by, reaching the maximum in the second decade after entering Congress, after which there was a decrease. In the first period, of two years, the mortality is only a little over half of the expected by the American Experience table and somewhat less than the expected if more modern tables had been used. After two years (or one Congressional term) it almost reaches and during substantially the next three decades exceeds, the expected, and after that time it falls back to three fourths of the expected.

These figures of themselves give no proof, of course, of what causes are at work. They, however, fit into the following hypotheses: (1) Congressmen are a select group having unusual vitality, and therefore a low mortality at the outset; (2) Congressional life with its responsibilities, heckling, excitements, worries, indoor and sedentary life, late hours, dining, wining, and other unhygienic conditions makes a severe drain on this vitality, showing itself in a gradually increasing mortality; and (3) some Congressmen contrive to avoid or to correct these unhygienic conditions and cause a partial return toward the original low mortality, after their less careful colleagues have died. At any rate the cardinal fact is clear that some cause or causes connected with entering Congress tends to kill Congressmen. They enter with more than the average vitality and after a single term of office possess less than the average vitality.

The same conclusion, namely that Congressional life sets, for some cause, a killing pace, is drawn from the following table:

MORTALITY OF CONGRESSMEN ACCORDING TO LENGTH OF SERVICE, NAMELY: (A) 6 YEARS OR LESS, (B) MORE THAN 6 YEARS IN PUBLIC SERVICE. (a)

(15 Congresses, ending March 3, 1911.)

Length of Service.	Age on Retirement from Congress.			
	All ages.	Under 50.	50–59.	60 and over.
6 years and under.....	97	112	103	74
Over 6 years.....	120	103	124	124

(a) This investigation is confined to the group of 15 Congresses ending in 1911. Public Service includes not only service in Congress, but also any subsequent service as President or Vice President, of the United States, Cabinet Officer, Governor of a State or Ambassador to a foreign country, and similar positions under the Southern Confederacy. For this study Congressmen were entered in the investigation *after* the number of years in Public Service pertaining to each had been completed. Thus the mortality comparisons for a man who entered Congress in 1880 and had twenty five years of Public Service ending 1905, began with 1905 and not with 1880.

The above table shows that, in general, those who have been in Public Service the longer time have a mortality of 120 per cent. as compared with 97 per cent. for those who have served the shorter time. This contrast is the more marked the older the men when retiring from Congress. Among those retiring at sixty years of age or older the ones who keep in Public Service the longer show a mortality of 124 per cent. as contrasted with 74 per cent. for those who have served the shorter time. Thus the killing pace of public life is more killing to the older men than to the younger.*

The following table (by years elapsed since retirement instead of by ages of Congressmen) was made to throw further light on the subject. It is confined to the last fourth of our Congresses.

*In fact, as the first column shows, for those retiring before the age of 50 the long service men show a slightly lower mortality than the short service men. This may be the effect of selection. It is probable that in general only the hardier men either can or will choose a long career of Public Service. Everyone knows that the strain of professional life often forces men to retire; some of these men undoubtedly have died soon afterwards. The existence of this selective influence emphasizes all the more the main conclusion that the longer the public service the greater the mortality. Moreover, somewhat apart from voluntary withdrawal from an extended public career on the part of those who find they cannot keep the pace, the contrast between the mortalities of the two groups would be still greater if there were any way of transferring from the shorter service group to the longer service group, those who died before the 6 years were up, but who, had they lived, would have been classified in the long term group.

FIFTEEN CONGRESSES ENDING MARCH 3, 1911, OBSERVED FROM DATE OF LAST RETIREMENT FROM CONGRESS.

(Ratio (per cent.) of Actual to Expected Deaths.)

Length of Public Service.	Number of Years from Retirement.	
	1-10.	Over 10.
6 years and under	105	89
Over 6 years	128	104

The above table shows the same contrast—higher mortality for the men who served over 6 years as compared with those who served less, *i. e.*, 128 per cent., as contrasted with 105 per cent., and also 104 per cent., as contrasted with 89 per cent. Incidentally, the table also shows that the adverse influence of public life is, as might be expected, felt mostly soon after retirement.

In the first decade after retirement the mortality is much higher than in the next decade as a comparison of the two columns shows. This may be due largely to the fact that many retire on account of ill health, while others may lose health as a consequence of defeat. Again, as already observed, those who survive the first 10 years after retirement are presumably those who have been able to avoid, or counteract the worries and bad hygiene which have killed off their colleagues.*

Thus far we have considered Congressmen as a single group. But the same conclusions apply separately to different periods in our national history, as the following table shows:

RATIO (PER CENT.) OF ACTUAL TO EXPECTED DEATHS.

Number of Years Elapsed Since First Entering Congress.	Group of Congresses Ending				All Combined.
	1821.	1851.	1881.	1911.	
1-10	94	112	82	85	91
11-20	119	116	97	102	107
21-30	115	110	92	86	101
31 and over	85	85	59		74

* The reason why the first table giving the mortality according to time elapsing since entering Congress shows a decided fall in mortality only after the 30 year mark, while this table shows a decided fall after the 10 year mark is clear, viz.: in the last table the years are reckoned from a later date than the first, i. e., from time of retirement instead of from time of entrance. In the former table those in the second and even the third decade after entering Congress, include many who had not yet retired.

The first group consists of the Continental Congresses and the first 16 regular Congresses ending with March 3, 1821, and the other three groups, each of 15 Congresses, ending respectively March 3, 1851, 1881, and 1911. The individual cases were classified in the four groups according to the date of first entering Congress. It will be observed by following the eye down any one of the columns of the table that the mortality always rises from the first to the second decade after entering Congress and falls thereafter, especially from the third to the fourth decades.

The above table also affords an opportunity to compare one historical period with another, if the eye is run through it horizontally instead of vertically. The most striking results of such comparisons are the lower mortality of the last two groups of Congresses as compared with the first two. The low mortality of the third group seems especially remarkable.

For historical comparison, however, the best data are those in which the mortality is presented by the attained ages of the Congressmen as in the following table, which for the present purpose should be read vertically:

RATIO (PER CENT.) OF ACTUAL TO EXPECTED DEATHS BY ATTAINED AGES.

Congresses.	All Ages.	Under 40.	40–49.	50–59.	60 and over.
Continental Congresses and 16 regular Congresses ending March 3, 1821	100	82	121	143	91
15 Congresses ending March 3, 1851	100	114	133	135	91
15 Congresses ending March 3, 1881	79	110	103	97	74
15 Congresses ending March 3, 1911	92	89	85	98	91

In this table we note: (1) that, in general, there has been an improvement in mortality from the earliest period of our history to modern times, the first two groups showing 100 per cent. each and the last two, 79 and 92 respectively; (2) that for the oldest age group—those dying over 60 years of age—there has been, generally speaking, no improvement, the figures being 91, 91, 74, and 91 per cent.; (3) that the Congresses of the third period of our history had an exceptionally low mortality, especially for the older ages.

It seems difficult to account for the exceptionally low mortality in the group of Congresses from 1851 to 1881. Probably there are several reasons, such as: (1) the temporary withdrawal (about 1861–1867) of the Southern contingent of Congressmen because of the Civil War (the insurance companies have experienced a higher mortality in the South than in other sections of the country and the statistics given below show the same contrast for Congressmen); (2) the stricter standard of living which prevailed during war time; (3) the inclusion in Congress of a larger proportion of men of "plain living and high thinking" during the period of and following the Civil War. The last named factor may account for the special superiority of the Congresses of the third period in respect to the older ages at which time the "wear and tear" diseases chiefly enter into mortality.

As has been previously stated, the expected deaths in the tables of this paper have been calculated by the American Experience table, which table shows a much higher death rate than is experienced by American insured persons at the present time. For instance, the present ratio of actual to expected deaths among the insurance companies of this country is about 75 per cent. of the American Experience table. Policyholders, however, have passed a medical examination, which is not the case with Congressmen. It is necessary, therefore, to turn to some other records in order to determine approximately what relationship to the American Experience table the mortality among Congressmen should have. In the Transactions of the Actuarial Society, Vol. X, there appears an analysis by Mr. E. B. Morris of the mortality experienced among Yale graduates.*

In order that a more detailed comparison with the mortality experience of Yale graduates may be made, the following tables have been prepared.

They show the mortality of Congressmen and the mortality of Yale graduates as compared with the American Experience table.

* The figures of Mr. Morris are, so far as I know, the only figures for any representative class of the population extending continuously from the eighteenth century through the nineteenth.

RATIO (PER CENT.) OF ACTUAL TO EXPECTED DEATHS.

Groups.	Attained Ages.				
	All Ages.	Under 40.	40–49.	50–59.	60 and Over.
31 Congresses ending March 3, 1851	100	98	128	139	91
Yale Graduates 1792 to 1849 of the Academic Department.....	86	125	115	92	75

RATIO (PER CENT.) OF ACTUAL TO EXPECTED DEATHS.

Groups.	Attained Ages.				
	All Ages.	Under 40.	40–49.	50–59.	60 and Over.
30 Congresses ending March 3, 1911	82	101	96	98	77
Yale Graduates 1850 to 1900 of the Academic Dept., Graduates 1852 to 1901 of Sheffield Scientific School, and Graduates 1843 to 1901 of Law School.....	76	70	81	79	85

The lower mortality of the Yale graduates is clearly brought out in the foregoing comparison.*

As to historical trends we may note such for the mortality of Yale graduates by taking the historical groups worked out by Mr. Morris. These extend back of our national history. The chief groups are three, covering substantially the eighteenth century and the two halves of the nineteenth in the following divisions: (1) the graduates 1701–1791; (2) the graduates of the Academic Department 1792–1849; (3) the graduates of the Academic Department 1850–1900; the graduates of the Sheffield Scientific School 1852–1901; and the graduates of the Law School 1843–1901.

The ratios of actual to expected deaths (according to the American Experience table) for these three groups were: 94, 86, and 76 per cent., respectively. It is evident from these figures that there has been a continuous improvement in mortality, as was the case among Congressmen. We also

* The Yale graduates of the medical school have not been included in the above tables. The experience in regard to these graduates had not been subdivided in the form desired for the above comparison. Although the mortality among medical graduates was somewhat higher than among the other graduates, the relative number of the medical graduates being small, their exclusion does not sensibly affect the comparison.

note for Yale graduates that there is an improvement as between the two periods for all ages except "60 and over" for which, on the contrary, there has been an increase of mortality, namely from 75 to 85 per cent.*

The recent cessation of improvement in middle age mortality and in some cases even the increase of mortality after middle age is a fact we encounter at almost every turn. It is even observable in insured lives in spite of improvements in the rigor of medical selection, especially for the older ages,† and in the classes constituting policy holders. The great medico-actuarial investigation conducted under Mr. Arthur Hunter showed that mortality at ages 60 and over "has shown no distinct improvement." For the three successive periods 1885–92, 1893–1900, 1901–08, the figures were 91, 98, 93 (based on a special table of mortality).‡ The tendency is, in fact, less observable among Congressional lives than in other quarters, owing probably to the fact that public men are today held more strictly to account for their personal conduct than formerly, when laxity of various kinds was condoned.

I close this paper by a geographic comparison of Congressmen from the Southern, Eastern, and Western sections § of the United States.

* Morris's figures show, for the higher ages (above 55), a decided retrogression. The mortalities for ages over 45 were:

(Dates Exact for Academic Department and Approximate for Others.)

	Ages.			
	46–55.	56–65.	66–75.	76 and Older.
1825–1849	98	74	75	70
1850–1874	60	81	86	93
1875–1900	88	211		

† See Eugene L. Fisk, M.D., "Force of Adverse Selection among Entrants at the Extremes of Life," Proceedings Assoc. Life Ins. Med. Directors, October 24, 1907. Pp. 129–170.

‡ See Medico-Actuarial Mortality Investigation, Vol. I, Actuarial Society. New York, 1912.

§ In the Southern states were included Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas. The Eastern states for this purpose were considered to be Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Delaware, Maryland, West Virginia, and the District of Columbia. The remaining states were classified as Western.

The results of this investigation based upon the group of 15 Congresses ending in 1911 are as follows:

	Ratio (per cent.) of Actual to Expected Deaths.
Southern	100
Eastern	93
Western	80
All states	92

The foregoing is in conformity with the experience of insurance companies—namely, that the Southern states have the highest mortality, and the Western states the lowest, while the Eastern states represent about the average mortality throughout the United States.

The results of this investigation may be summarized in the following statistical generalizations:

1. The mortality of Congressmen for the two years immediately after entering Congress has been low, being very much lower than that of the American Experience table and materially lower than the mortality of Yale graduates from 1792 on.

2. The mortality of Congressmen in the next eight years of life was much higher, being about equal to that of the American Experience table and above the mortality of Yale graduates. Again, their mortality in the next decade was still higher.

3. Those Congressmen surviving beyond the second decade showed, in turn, a much lower mortality.

4. Those Congressmen whose Public Service was only 6 years or less showed a materially lower mortality than those whose Public Service extended beyond 6 years.

5. The mortality of our modern Congressmen is in general lower than that of their predecessors.

6. This historical improvement in Congressional mortality is greatest for the younger ages—in accordance with the observations on mortality of the general population.

7. For the ages "60 and above" there has been no improvement. This is also in accordance with observations on the mortality of the general population.

8. The Congressional mortality during and soon after the Civil War was exceptionally low.

9. This low mortality for the Civil War period was especially marked for the older ages.

10. The last five conclusions (as to historical changes in mortality) are, in general, consonant with the results of the investigations of Mr. E. B. Morris for Yale graduates. (In the case of Yale graduates the mortality at older ages has not only not improved but has grown worse.)

11. Comparing the mortality of Southern, Eastern, and Western Congressmen we find that of the Southerners was the highest and that of the Westerners the lowest, the figures being 100, 93, and 80 per cent. for the South, East, and West respectively.

In the above generalizations no mention has been made of the mortality of Presidents and Vice Presidents. This seems to be high and to show a consistent progressive change for the worse; but the number of lives available is so small, compared with the number of Congressmen considered, as scarcely to justify independent generalizations.

The foregoing generalizations merely give the facts as we find them without reference to their interpretation. The facts may seem to different people capable of different interpretations. My own interpretation is one into which all the facts fit perfectly and which is also in tune with the results of E. B. Morris's investigations for Yale graduates and other studies, such as certain investigations of the United States Census and of the Life Extension Institute. This interpretation is as follows:

(a) Presidents, Vice Presidents, and Congressmen are a select group endowed at the outset with unusual vitality.

(b) The vitality of most of them is severely taxed and materially reduced by the heavy responsibilities and bad personal hygiene incident to a public career.

(c) A minority escape the worst of these conditions and retain the major part of their natural endowment of vitality.

(d) Bad hygiene has been more destructive than the weight of responsibility. This conclusion is suggested by the fact that the Vice Presidents suffer a greater curtailment of life

than the Presidents, although Vice Presidents have far less responsibility but spend much more time in Washington social life than the Presidents. It is also suggested by the fact that the Civil War period, with its greater weight of responsibility but more simple living, showed a lower mortality than the periods preceding and following, with less weight of responsibility, but less simple living.

(e) Historically there has been a progressive decrease in those causes of death consisting of *infections* which kill their victims chiefly at the earlier ages, but a progressive change for the worse in those causes of death consisting of the *wear and tear* diseases (or degenerative diseases) which kill their victims chiefly at the later years. These opposite changes in the infectious and degenerative diseases would explain the improvement in mortality at the earlier ages and, on the other hand, the non-improvement (and in the case of the Yale graduates even positive retrogression) in the mortality at the older ages; again they would explain the marked exceptionality of the older ages in the Civil War period; for if it was plain living which explained the low mortality of that period we should expect the most marked influence of this factor to appear, just as it does, at the older ages at which the wear and tear mortality is chiefly registered.

(f) The chief causes of wear and tear on the lives of Congressmen are the same as those applying to modern convivial social life in general; they are the causes emphasized by the Life Extension Institute which, through its Hygiene Reference Board of hygienists and scientists, has described these causes in its recent hand book "How to Live." The chief causes emphasized are indoor and sedentary living, a crouching, cramping posture, late dinners, overeating, especially of nitrogenous foods, such as meat and eggs, overconcentration or lack of bulk in diet, hasty eating, constipation, irregular hours, lack of sleep, worry, and the use of drugs, especially narcotics like alcohol and tobacco. In short, the chief reasons why Congressmen shorten their lives are avoidable, being due, not so much to their work as to the kind of life into which their work leads them.

The damage to vitality which we find from public life is not, therefore, put forward as an argument against entering public service; nor will a knowledge of the facts probably tend in that direction, certainly not among those who place public interests above personal interests, as every public man should. But knowledge is power and a knowledge of the facts should enable us to protect our public men or enable them to protect themselves, and to do so in the public interest. This can be accomplished by better general health conditions in the country and its Capital, by better health customs and habits, by better health ideals, and by a more systematic application of the imperfect ideals already existing.

THE AGRICULTURAL ELEMENT IN THE POPULATION.*

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It is the function of the agricultural element in the population to produce the raw material to feed and clothe the nation. The Census for the United States does not classify the population according to their source of income, but in many of the European countries such a classification is made. The agricultural element in these countries includes those actively engaged in agriculture, members of their families and others dependent upon them for subsistence, and servants living in the household of their masters. As far as making a study of the agricultural element in the population of the United States is concerned, we have to make it by inference, from a study of those who are gainfully employed in agriculture and of the rural population as defined by the Census. Countries that show not only the number employed in agriculture but the number "dependent" upon agriculture, offer a method of measuring the agricultural element in the population of those countries for which we have only occupation statistics. It appears that the percentage that the male agricultural workers makes of the total male workers is the best index of the relative importance of the agricultural element in the population. This eliminates, or greatly diminishes the influence of the wide variations found in the percentage of the total population that has reached the productive age periods, the differences in the participation of women in the work of the nation and their inclusion in occupation statistics, and also the differences in definitions as to when a person is gainfully employed.

In practically all countries where the number dependent upon agriculture is known, they form a decreasing proportion of the total population. Wherever a comparison of the male

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agricultural workers with the total males gainfully employed is available, the agricultural workers form a decreasing proportion of the total. Thus is released to engage in other occupations a corresponding percentage of the total workers. Apparently the principal reasons for this decreasing percentage are that the agricultural element in the population is becoming more efficient and that in the readjustment or changes in the methods of producing and distributing agricultural products, the agricultural people now perform a smaller part of the complete operations than was the case formerly. For example, cheese was manufactured in the home; now it is a factory product. There is a smaller proportion of meat slaughtered and cured on the farm than formerly. Farmers perform a smaller part of the hauling of farm produce to market because the railroads more thoroughly cover the country.

Many persons, in calling attention to the decreasing proportion of the population living in rural districts, feel that this is a national calamity. Indeed if it should happen that an increasing proportion of our people were found on farms it would be a sure sign that our agricultural people were losing their efficiency and should be cause for alarm. If conditions in the United States were similar to those in China there would be between 70 and 75 per cent. of the population engaged in agriculture or dependent on it for their subsistence, whereas in the United States in 1910, only 35 per cent. were so engaged. In other words, the agricultural element in the population of the United States is twice as efficient as the agricultural element in the population of China, to say nothing of the difference in the standards of living of the population of China and that of the United States.

The evidence of the fact that the agricultural element in the population of the United States is becoming more efficient is abundant. The per capita crop production based on total population increased 30 per cent. between 1856 and 1915, while the percentage that the males engaged in agriculture formed of those engaged in all occupations decreased from 50 to 35 per cent. in the last 30 years. In other words, we are producing more crops per capita and use a smaller percentage of our total population for the purpose.

As for the meat supply, the per capita production during the last 15 years has remained practically constant or decreased slightly. However, there is a decreased consumption of beef and mutton and an increased consumption of poultry, the consumption of pork remaining practically the same. It is the natural evolution of agricultural nations to consume relatively large quantities of meat in their early development, but as the country becomes more thoroughly settled and the land higher in price, the crops are consumed by the people direct rather than after their transformation into meat. By this means a larger number of persons can be supported on a given acreage.

Another indication of the increased efficiency of our agricultural workers is the fact that the average number of acres of crops cultivated per agricultural worker is increasing and this increase is accompanied by an increased number of horses on farms per agricultural worker, and by an increase in average yields per acre.

If we study that portion of the United States where there has been an actual decrease in rural population, we find that this decrease occurs principally in counties in the Northcentral, New England, and Middle Atlantic States where there has been a decrease in the number of farms. If we indicate on maps the actual decrease in farms by sizes, the decrease in the number of farms of between 20 and 49 and 50 and 99 acres, will practically explain the decrease in the total number of farms and the consequent decrease in rural population. The farm management studies indicate that on these small-sized farms, man labor, horse labor, and agricultural machinery can not be used efficiently. In other words, economic competition is eliminating the unprofitable sized farms.

It is also interesting to note the type of farm from which the boys and girls are leaving most rapidly. We find that wherever investigations of this nature have been conducted, a smaller percentage of children are found at home on farms between 20 and 100 acres than on those of a larger size.

There is also another change taking place in the Northcentral States that helps to explain the decrease in rural population. The absolute number of foreign born in rural districts of the

Northcentral States is decreasing and those of foreign or mixed parentage apparently have reached their maximum numbers. It is a well-known fact that the foreign born have larger families and that the native born have smaller families, and that as the children of the foreign born become more thoroughly Americanized the size of their families decreases. Thus the decrease in rural population in the Northcentral States is due not only to a small number of farm families but also to smaller families.

It is also worthy of notice that the rural population is decreasing in areas where the rural telephone, coöperative agricultural organizations, and coöperative fire insurance companies are to be found in greatest numbers. These are evidences of an efficient and progressive agricultural people.

It is a well-accepted principle of economics that there is a flow of laborers from different classes of occupations and the different markets similar to the flow of money or gold from the different money markets of the world. Anything that tends to upset the relation between the supply and demand of labor in one field of endeavor sets in motion a migration from one part of the country to another or from one country to another. The relationship between the rural and the urban population of the United States is rendered unstable by differences in birth rate, death rate, and by migration.

The following differences in the rural and urban communities influences the number of births. It appears that at all ages a larger percentage of those living in rural districts are married and that the difference is greatest at the youngest ages, that is at the ages of greatest fecundity. The average age at death of females in cities is much lower than that in rural districts, with the result that the urban woman has a shorter married life. That the marriage relationship is more often interrupted by death in urban districts is shown by the greater percentage of widowed persons. When we compare the average number of years married per child born, we find that the average for persons of the same nativity is greater in urban than in rural districts, but that it is lowest for the foreign born and increases as we approach the native born of native parentage. If the population of the United States were made up

wholly of persons native born of native parentage, the birth rate in the rural districts would be 40 to 50 per cent. higher than in urban districts, but since the native born of native parentage are in the majority in the rural districts and the foreign born and their children in the urban districts, the relative birth rate appears to be about equal.

There are changes taking place in the relative proportion of the different nativities in the rural districts that have an important bearing upon the future of the rural population. I have already mentioned that in the Northcentral States, the foreign born and their children apparently are either actually decreasing or have reached their maximum, but we find that in the New England and Middle Atlantic States there are less persons native born of native parentage in rural districts today than there were 20 years ago, while those of foreign birth or of foreign and mixed parentage are on the increase. This is evident not only from a study of the relative number of foreign born in the total rural population, but also from a study of the year of immigration, a much larger percentage having come to the New England and Middle Atlantic States in the last ten years than to any other geographic division where the foreign born are found in considerable numbers. It appears that as more intensive agriculture becomes profitable the foreign born begin to take the place of the native born whites. This raises the question as to whether this same evolution will take place throughout the whole United States as our country develops and our entire agricultural system takes on a more intensive nature.

Another factor contributing to the migration from rural to urban districts is the difference in death rates. We find when the death rate is compared age for age, it is higher in the urban than in the rural districts by 10 to 50 per cent. and that the difference is generally greatest at those ages at which the largest number of deaths occur. This has an influence not only on age distribution and migration but upon the length of the working life. For example, the average age at death for all classes of people in 1910, is 35.4 for males in urban districts and 42.4 in rural districts. If we consider that the average age at which our population becomes productive is 15, it means

that those dying in the rural districts lived an average productive life of practically 35 per cent. longer than those in urban districts.

The average age for females is 37.4 and 43.3, respectively. Even if the average age at which those in urban and rural districts married were the same, the difference in the age at death would add over five years to the married life of those married. If we make a comparison of those who are native born of native parentage we find that the age at death for urban males is 31.4 and rural males 38.2, and for females 35.2 and 40.7, respectively. This difference in the average age at death does not measure entirely the difference in the average length of the productive life in the two areas, because of the migration from rural districts to cities of persons who are above the average age of the beginning of productivity.

Even if the birth rate for urban and rural districts were the same, the greater death rate in cities would result in a smaller percentage of those born in our cities reaching the productive age period. Even though at the birth there were a proper equilibrium between the potential supply of labor in urban and rural districts, when 15 years of age was reached this equilibrium would be upset, and it would be necessary to transfer some of those living in rural districts to urban districts to bring the supply back to the normal demand.

If we compare the number of persons in our cities between 5 and 14 years of age and 15 and 24 years, we find for native white females of native parentage that there is an excess in the age group 15 to 24 over the number of those 5 to 14. In other words, the migration of young women from rural districts has been sufficiently large not only to overcome the losses by death in urban districts, but to increase from 2 to 20 per cent. the number between 5 and 14 years of age. We find the same condition true for males except that the percentages are not so high and that in three geographic divisions it was not sufficient to overcome the losses by deaths.

This migration from rural districts appears practically to cease at 35 years of age, and the higher death rate in cities accounts for the fact that a larger percentage of those in rural districts survive.

Perhaps the most interesting feature in the migration from our rural districts to our cities is that the white women are migrating in greater numbers and that their migration begins at an earlier age. We find that in practically all counties there is an excess of males in the rural districts and when we compare by sex and by age groups the percentage of the total population living in rural districts we find an excess of men at all ages.

However, Negro women form a striking exception to this statement. We find that in the South a majority of the counties have an excess of Negro females in the rural districts, the excess being due principally to an excess of females in the middle age groups. At all other ages the males predominate in the rural districts.

The conditions in the United States are more interesting when compared with the diagrams and statistics relating to conditions in European countries. For example, if we compare the percentage of the total population dependent upon agriculture by ages and sexes, we find that the percentage of females dependent on agriculture is greatest in Austria and Germany up to 60 years of age. Above this year, apparently, the presence of old-age pensions and the classification of people as dependent upon an industry influences the distribution. In the rural districts of England and Wales we find an excess of males up to 15 to 20 years of age, after which there is an excess of females. In the rural districts of Denmark, the excess of females does not begin until 30 years of age is reached.

In European countries where the agriculture is carried on by means of hand labor we find an excess of females in both the agricultural and rural population. The extensive use of agricultural machinery in the United States is probably the cause of the migration of women from rural districts. As long as women are employed in the fields they contribute to the farm income. When an agricultural machine is introduced, it not only takes away the field work of the farm women so that they become of less economic value on the farm, but it also makes them seek remunerative employment elsewhere. For example, if a machine were introduced to pick the cotton

of the South, the Negro women would have to seek other fields for employment.

Thus it is evident that the reason for the decreasing percentage of all peoples found in rural districts and the migration of young men and women from our farms, is that as the agricultural element in the population becomes more efficient, a smaller percentage of them is needed on farms and they have to seek employment in the non-agricultural industries.

The higher death rate, age for age, in urban districts depletes the ranks of the workers so that the rural peoples are called upon not only to furnish raw material to feed and clothe the nations, but to fill up the ranks of the city workers and to contribute to the supply of labor demanded by our growing industries.

TABLE I.

NUMBER OF PERSONS DEPENDENT UPON AGRICULTURE.

Country.	Year.	Males.		Females.		Both Sexes.	
		Number.	Per Cent. of Total Population.	Number.	Per Cent. of Total Population.	Number.	Per Cent. of Total Population.
Austria	1900	6,505,725	50.6	6,941,637	52.2	13,447,362	51.4
	1890	6,333,786	54.2	6,815,414	55.8	13,149,200	55.0
	1880	5,854,945	54.1	6,417,420	56.7	12,272,365	55.4
Hungary	1900	6,542,821	68.3	6,518,297	67.4	13,061,118	67.8
	1890	.....	....	.....	....	10,905,444	62.4
Total	1900	13,048,546	58.2	13,459,934	58.6	26,508,480	58.4
	1890	.....	....	.....	....	24,054,644	58.2
British India	1901	.....	....	.....	....	191,691,731	65.1
	1891	.....	....	.....	....	171,735,390	59.8
Bulgaria	1905	1,541,189	74.9	1,548,112	78.2	3,089,301	76.6
	1900	1,394,800	73.0	1,387,469	75.6	2,782,269	74.3
	1893	1,224,534	72.4	1,207,024	74.5	2,431,558	73.4
	1888	1,152,112	71.8	1,163,015	75.1	2,315,127	73.4
Denmark	1911	523,046	39.1	480,916	33.9	1,023,962	37.1
	1906	511,814	40.7	479,107	36.0	990,921	38.3
	1901	491,959	41.2	463,803	36.9	955,762	39.0
	1890	445,779	42.1	436,557	39.2	882,336	40.6
	1880	447,360	....	441,571	....	888,931	45.1
	1870	396,621	....	392,114	....	788,735	44.2
	1860	.....	....	.....	....	727,184	45.4
	1845	.....	....	.....	....	614,619	45.5
	1834	.....	....	.....	....	598,558	48.9
Finland	1900	775,380	57.8	779,977	56.9	1,555,357	57.3
France	1891	8,780,924	46.4	8,654,964	45.1	17,435,888	45.7
	1886	8,824,391	46.7	8,874,011	46.6	17,698,402	46.7
	1881	9,156,873	49.1	9,092,336	48.5	18,249,209	48.8
	1876	9,514,219	51.8	9,454,386	51.0	18,968,605	51.4
	1872	9,231,741	51.3	9,281,584	51.2	18,513,325	51.3
	1866	9,095,515	47.8	9,199,334	48.3	18,294,849	48.1
	1861	.....	....	.....	....	16,030,745	42.9
Germany	1907	8,060,282	26.5	9,029,214	28.9	17,089,496	27.7
	1895	8,648,414	34.0	9,420,249	35.7	18,068,663	34.9
	1882	9,047,866	40.8	9,792,952	42.4	18,840,818	41.7
Norway	1900	414,479	38.9	440,308	38.1	854,787	38.5
	1891	391,516	41.2	434,735	41.9	826,251	41.5
	1875	436,867	49.8	465,882	50.1	902,749	50.0
Portugal	1900	1,646,605	63.5	1,720,594	60.8	3,367,199	62.1
Russia:							
Caucasus	1897	.....	....	.....	....	7,266,428	78.2
Central Asia	1897	.....	....	.....	....	6,361,466	82.1
Poland	1897	.....	....	.....	....	5,302,850	56.4
Russia Proper	1897	.....	....	.....	....	69,470,360	74.3
Siberia	1897	.....	....	.....	....	4,448,456	77.2
Total	1897	.....	....	.....	....	92,849,560	73.9
Servia	1900	1,055,300	82.4	1,042,688	86.1	2,097,988	84.2
	1895	975,399	82.2	959,134	85.2	1,934,533	83.7
	1890	900,612	81.1	916,611	87.1	1,817,223	84.1
Sweden	1900	1,182,649	47.2	1,161,963	44.2	2,344,612	45.6
	1890	1,204,325	52.0	1,203,461	48.8	2,407,786	50.3
	1880	1,156,678	52.2	1,157,441	49.2	2,314,119	50.7
	1870	.....	....	.....	....	2,286,309	54.8
Switzerland	1900	566,682	34.8	501,223	29.7	1,067,905	32.2
	1888	576,019	40.6	530,411	35.4	1,106,430	37.9
	1880	587,895	42.2	550,783	37.9	1,138,678	40.0
	1870	576,594	44.2	555,072	40.7	1,131,666	42.4

TABLE II.

NUMBER OF PERSONS ENGAGED IN AGRICULTURE IN VARIOUS COUNTRIES.

Country.	Year.	Males.		Females.		Both Sexes.	
		Number.	Per Cent. of All Occupations.	Number.	Per Cent. of All Occupations.	Number.	Per Cent. of All Occupations.
United States...	1910	10,582,039	35.2	1,806,584	22.4	12,388,623	32.5
	1900	9,272,315	39.0	977,336	18.4	10,249,651	35.3
	1890	7,787,539	41.4	678,824	17.3	8,466,363	37.2
	1880	7,068,658	47.9	594,385	22.5	7,663,043	44.1
Algeria.....	1881	636,078	74.8	91,602	53.7	727,680	71.3
Argentina.....	1895	318,149	28.0	67,174	13.4	385,323	23.6
Australia.....	1901	377,626	29.5	39,029	11.1	416,655	25.6
Austria.....	1900	3,997,660	50.7	4,116,098	70.2	8,113,758	59.1
	1890	4,098,695	55.3	4,295,943	73.9	8,394,638	63.5
	1880	3,427,835	51.7	2,728,830	60.7	6,156,665	55.4
	1870	.....	....	.....	....	7,506,395	62.6
Hungary.....	1900	4,187,590	68.6	1,819,707	70.4	6,007,297	69.1
	1890	3,913,001	71.8	1,469,675	67.1	5,382,676	70.5
Total.....	1900	8,185,250	58.5	5,935,805	70.3	14,121,055	63.0
	1890	8,011,696	62.3	5,765,618	72.0	13,777,314	66.1
Belgium.....	1900	533,665	23.6	163,707	17.6	697,372	21.9
	1890	489,545	24.6	159,707	19.1	649,252	23.0
	1880	542,006	30.8	265,458	28.8	807,464	30.1
	1856	709,214	48.9	352,901	42.7	1,062,115	46.7
	1846	550,567	42.4	356,008	47.0	906,575	44.0
Bolivia.....	1900	.....	....	.....	....	564,009	43.5
British India....	1901	63,026,365	67.3	27,867,210	66.5	90,893,575	67.1
	1881	52,029,098	64.1	19,169,870	50.7	71,198,968	59.9
British North Borneo...	1901	.....	....	.....	....	32,892	64.2
Bulgaria.....	1905	895,206	73.3	837,406	94.9	1,732,612	82.4
	1900	798,928	71.5	730,870	93.1	1,529,798	80.4
	1893	652,723	71.4	657,324	73.9	1,310,047	72.6
	1888	621,196	72.7	677,445	82.2	1,298,641	77.4
	1881	415,316	70.8	349,552	90.7	764,868	78.7
Canada.....	1901	707,997	45.4	8,940	3.7	716,937	39.9
Ceylon.....	1901	745,074	65.0	318,551	65.4	1,063,625	65.1
Chile.....	1907	448,546	50.3	21,877	6.2	470,423	37.7
Cuba.....	1907	364,821	52.2	3,110	4.2	367,921	47.6
	1899	.....	....	.....	....	299,197	48.1
Cyprus.....	1901	33,611	62.8	2,757	20.8	36,368	54.5
Denmark.....	1911	386,016	45.7	110,169	28.5	496,185	40.3
	1901	366,860	48.4	149,760	41.5	516,620	46.2
Egypt.....	1907	2,258,005	67.2	57,144	33.3	2,315,149	65.6
	1897	2,049,643	64.5	.....	....	2,049,643	63.1
Federated Malay States....	1901	115,027	28.2	52,324	82.7	167,351	35.5
Finland.....	1900	321,538	51.4	102,008	39.6	423,546	48.0
Formosa.....	1905	763,456	70.6	263,664	82.4	1,027,120	73.3
France.....	1906	5,452,392	41.9	3,324,661	43.2	8,777,053	42.4
	1901	5,454,940	42.3	2,654,316	39.0	8,109,256	41.1
	1896	5,611,628	44.7	2,747,709	42.9	8,359,337	44.1
	1891	4,694,714	42.4	1,840,885	35.9	6,535,599	40.3
	1886	4,777,729	43.2	2,138,236	37.8	6,915,965	41.4
	1881	4,603,412	41.1	1,650,411	30.1	6,253,823	37.5
	1876	5,088,337	48.1	1,548,113	30.3	6,636,450	42.3
	1872	4,579,838	....	1,298,085	....	5,877,923	40.2
	1866	4,629,752	44.1	1,568,234	33.8	6,197,986	40.9
Germany.....	1907	5,146,723	27.7	4,585,749	48.3	9,732,472	34.6
	1895	5,410,205	34.8	2,745,840	41.7	8,156,045	36.9
	1882	5,588,892	41.7	2,531,626	45.7	8,120,518	42.8
Greece.....	1907	321,120	47.3	6,972	12.2	328,092	44.6
Grenada.....	1901	8,816	57.1	7,722	49.7	16,538	53.4
Italy.....	1901	6,370,277	57.9	3,196,063	60.5	9,566,340	58.8
	1882	5,396,901	53.0	3,094,272	47.2	8,491,173	50.7
	1872	5,537,427	57.5	3,027,466	53.0	8,564,893	55.9
	1862	4,869,421	58.1	2,839,210	51.2	7,708,631	55.4
Jamaica.....	1911	.....	....	.....	....	271,493	66.1
	1891	.....	....	.....	....	271,296	72.6
	1881	.....	....	.....	....	208,587	71.7
Malta and Gozo.	1901	10,235	13.3	3,613	15.8	13,848	13.9
Mauritius.....	1901	72,493	57.1	5,989	38.0	78,482	55.0

TABLE II—*Concluded.*

Country.	Year.	Males.		Females.		Both Sexes.	
		Number.	Per Cent. of all Occupations.	Number.	Per Cent. of All Occupations.	Number.	Per Cent. of all Occupations.
Netherlands	1899	490,694	32.9	79,584	18.4	570,278	29.6
	1889	451,756	34.8	72,868	20.6	524,624	31.7
	1859	217,935	19.0	35,698	7.3	253,633	15.5
	1849	229,422	21.7	95,349	18.5	324,771	20.6
New Zealand ...	1911	103,644	28.5	7,472	8.3	111,116	24.5
	1906	93,504	28.9	3,453	4.6	96,957	24.3
	1901	85,323	31.1	3,899	5.9	89,222	26.2
	1896	80,194	33.4	3,106	5.9	83,300	28.4
	1891	65,950	31.8	2,657	5.9	68,607	27.1
	1886	64,259	34.1	919	2.8	65,178	29.5
	1881	53,769	33.0	678	2.7	54,447	29.0
Norway.....	1910	.....	....	.....	....	307,528	33.4
	1900	237,705	39.6	71,311	25.3	309,016	35.0
	1891	226,688	42.7	84,890	34.7	311,578	40.2
	1875	170,995	37.9	15,142	7.9	186,137	28.9
Philippine Is. ...	1903	1,163,777	57.8	90,286	8.8	1,254,063	41.3
Porto Rico	1899	196,893	73.3	1,868	3.9	198,761	62.8
Portugal.....	1900	1,127,268	65.3	380,293	52.0	1,507,561	61.4
Russia:							
Russia Proper.	1897	11,464,216	60.4	1,671,399	38.0	13,135,615	56.2
Poland.....	1897	1,074,914	48.0	218,706	37.0	1,293,620	45.7
Caucasia.....	1897	1,269,375	65.2	84,059	40.8	1,353,434	62.9
Central Asia .	1897	1,251,416	75.7	32,329	20.8	1,283,745	69.3
Siberia.....	1897	841,549	63.5	72,808	38.4	914,357	60.4
Total.....	1897	15,901,470	60.7	2,079,301	37.5	17,980,771	56.7
St. Lucia.....	1901	.....	....	.....	....	15,796	54.1
Servia.....	1900	311,700	65.5	13,524	50.5	325,224	64.7
	1895	.....	....	.....	....	299,060	67.9
	1890	.....	....	.....	....	288,539	70.6
Sierra Leone....	1901	8,705	28.7	4,544	21.7	13,249	25.9
Spain.....	1900	3,741,730	58.1	775,270	51.8	4,517,000	56.9
	1887	4,033,391	72.0	821,351	57.6	4,854,742	69.1
Sweden.....	1900	761,016	52.4	333,264	53.8	1,094,280	52.8
	1890	759,925	58.4	330,266	58.6	1,090,191	58.5
	1880	728,944	59.1	329,054	60.4	1,057,998	59.5
Switzerland.....	1900	392,971	37.1	80,326	16.1	473,297	30.4
	1888	388,467	44.6	92,566	21.3	481,033	36.8
	1880	398,873	44.5	147,589	29.1	546,462	38.9
	1870	388,297	47.5	159,944	34.3	548,241	42.7
Trinidad and Tabago ..	1901	51,744	54.7	25,765	39.3	77,509	48.4
Union of South Africa:							
Cape of Good Hope	1904	524,228	64.9	485,246	81.7	1,009,474	72.0
	1891	383,612	75.0	288,846	79.2	672,458	76.8
Natal.....	1904	33,716	36.9	6,416	51.2	40,132	38.6
Orange River Colony...	1904	91,986	60.2	61,028	50.8	153,014	56.0
Transvaal	1904	213,293	44.5	294,367	80.3	507,660	60.0
Total.....	1904	863,223	56.3	847,057	77.5	1,710,280	65.1
England and Wales....	1901	1,158,940	11.4	38,982	0.9	1,197,922	8.4
	1891	1,234,101	14.0	51,045	1.3	1,285,146	10.1
	1881	1,288,328	16.6	64,216	1.9	1,352,544	12.1
	1871	1,391,630	21.2	186,101	5.7	1,577,731	16.0
Scotland.....	1901	176,816	12.7	28,191	4.8	205,007	10.3
	1891	183,902	15.3	29,158	5.4	213,060	12.2
	1881	188,523	17.3	51,647	10.7	240,170	15.2
	1871	187,947	19.2	50,464	10.3	238,411	16.2
Ireland.....	1901	774,056	55.2	85,469	15.6	859,525	44.1
	1891	831,753	57.2	90,967	15.4	922,720	45.1
	1881	885,518	58.1	95,838	15.1	981,356	45.4
	1871	891,890	53.6	170,118	19.3	1,062,008	41.7
	1861	904,748	49.5	84,181	10.0	988,929	37.0
United Kingdom	1901	2,109,812	16.3	152,642	2.9	2,262,454	12.4
	1891	2,249,756	19.6	171,170	3.4	2,420,926	14.6
	1881	2,362,369	22.8	211,701	4.7	2,574,070	17.3
	1871	2,471,467	26.8	406,683	8.8	2,878,150	20.8

TABLE III.

PERCENTAGE OF TOTAL RURAL AND URBAN POPULATION OF THE UNITED STATES, CLASSIFIED BY NATIVITY.

Nativity and Geographic Division.	Rural.			Urban.		
	1910.	1900.	1890.	1910.	1900.	1890.
Native Parentage.						
New England	69.8	73.0	77.6	33.9	37.8	43.6
Middle Atlantic	67.0	70.6	71.3	34.4	35.8	35.8
East North Central	66.4	64.9	64.3	41.7	38.8	36.8
West North Central	58.5	57.5	59.3	51.2	47.8	45.6
South Atlantic	62.2	60.8	59.9	54.2	50.0	45.9
East South Central	67.2	65.3	65.0	54.4	47.6	44.1
West South Central	67.7	64.4	61.4	58.4	47.4	41.7
Mountain	57.8	52.9	50.4	51.9	47.2	47.6
Pacific	54.8	54.8	54.6	46.9	40.6	36.8
Total, United States	64.1	63.2	63.3	41.9	40.2	39.7
Foreign or Mixed Parentage.						
New England	17.0	14.9	11.5	34.2	31.6	26.6
Middle Atlantic	17.6	16.6	15.5	33.6	34.8	33.3
East North Central	22.4	23.0	21.3	33.0	35.8	33.2
West North Central	27.4	26.7	22.6	28.2	30.4	27.5
South Atlantic	1.4	1.4	1.4	10.1	12.2	13.0
East South Central	1.0	1.2	1.4	9.5	13.2	14.8
West South Central	5.4	5.5	4.3	12.1	16.9	18.9
Mountain	21.2	24.1	21.2	27.3	30.2	25.0
Pacific	22.4	23.4	19.6	27.2	31.4	28.2
Total, United States	13.3	13.6	12.4	29.0	30.9	28.7
Foreign Born.						
New England	12.6	11.5	10.4	30.7	29.3	28.6
Middle Atlantic	13.9	11.2	11.7	29.5	26.8	28.7
East North Central	10.2	11.1	13.2	22.8	22.9	27.5
West North Central	12.6	13.9	15.8	16.3	17.0	21.8
South Atlantic	1.1	0.8	0.8	6.2	6.5	8.3
East South Central	0.4	0.5	0.7	3.7	5.0	7.6
West South Central	3.1	3.1	3.2	7.0	8.8	12.3
Mountain	15.7	15.9	18.6	18.3	19.9	24.0
Pacific	18.4	16.5	18.7	22.2	23.1	28.0
Total, United States	7.5	7.5	8.7	22.6	22.2	24.8
Colored.						
New England	0.6	0.6	0.5	1.2	1.3	1.2
Middle Atlantic	1.5	1.6	1.5	2.5	2.6	2.2
East North Central	1.0	1.0	1.2	2.5	2.5	2.5
West North Central	1.5	1.9	2.3	4.3	4.8	5.1
South Atlantic	35.3	37.0	37.9	29.5	31.3	32.8
East South Central	31.4	33.0	32.9	32.4	34.2	33.5
West South Central	23.8	27.0	31.1	22.5	26.9	27.1
Mountain	5.3	7.1	9.8	2.5	2.7	3.4
Pacific	4.4	5.3	7.1	3.7	4.9	7.0
Total, United States	15.1	15.7	15.6	6.5	6.7	6.8

TABLE IV.

CHANGES IN THE RURAL AND URBAN POPULATION IN 1910 AND 1900 COMPARED WITH 1890.

(1890=100 per cent.)

Census Year and Grand Division.	Native Parentage.		Foreign or Mixed Parentage.		Foreign Born.		Colored.		Total.	
	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.
1910.										
New England	86.7	119.0	142.4	196.7	116.1	164.6	118.4	156.3	96.3	153.2
Middle Atlantic	97.8	179.9	118.2	188.6	123.7	192.0	109.0	220.4	104.1	187.1
East North Central	106.4	213.8	108.1	187.7	79.4	156.4	88.7	186.9	103.0	188.7
West North Central	115.5	188.5	142.3	171.6	94.0	125.4	76.6	143.0	117.2	167.8
South Atlantic	132.6	211.2	128.8	139.7	166.9	134.0	119.0	160.6	127.7	178.9
East South Central	126.0	238.0	85.0	124.4	74.2	92.7	116.0	185.8	121.8	192.6
West South Central	197.3	382.8	211.3	174.1	164.2	155.4	129.5	228.0	169.6	273.4
Mountain	225.4	290.8	197.0	290.9	165.2	202.7	106.1	195.0	196.4	266.4
Pacific	167.1	378.9	190.5	286.4	164.0	235.4	103.5	157.4	166.6	297.1
Total, United States	124.3	197.8	131.3	189.5	106.4	171.0	118.2	180.5	122.7	187.6
1900.										
New England	92.7	109.0	127.5	148.8	108.6	128.4	120.8	138.8	98.5	125.5
Middle Atlantic	99.0	137.7	107.4	143.6	96.1	127.9	108.1	163.1	100.1	137.4
East North Central	105.5	149.1	112.8	152.7	87.7	117.9	93.5	145.4	104.6	141.6
West North Central	108.2	133.8	132.4	141.0	98.7	99.5	91.1	120.0	111.7	127.6
South Atlantic	116.8	140.8	120.9	120.9	106.1	102.1	112.6	123.1	115.2	129.2
East South Central	114.8	149.5	105.2	123.5	83.0	91.8	114.4	141.0	114.3	138.4
West South Central	142.8	167.9	171.7	131.4	132.3	105.8	118.0	146.8	136.0	147.7
Mountain	138.7	151.1	150.2	183.5	113.1	126.2	94.9	121.7	132.0	152.2
Pacific	119.7	154.6	142.6	155.6	105.2	115.3	87.3	98.7	119.1	140.0
Total, United States	112.2	137.2	122.9	146.0	97.3	121.1	112.8	134.4	112.4	135.5

TABLE V.

AVERAGE AGE AT DEATH BY COLOR AND NATIVITY.

Color and General Nativity.	1900.				1910.			
	Cities in Registration States.(a)		Rural Part of Registration States.(a)		Cities in Registration States.(a)		Rural Part of Registration States.(a)	
	All Ages.	15 Years and Over.	All Ages.	15 Years and Over.	All Ages.	15 Years and Over.	All Ages.	15 Years and Over.
Aggregate	32.4	51.5	44.7	59.5	36.3	53.0	42.8	59.1
Males	31.0	50.5	44.3	59.8	35.4	51.8	42.4	58.6
Females	33.9	52.6	45.1	59.1	37.4	54.4	43.3	59.7
White	32.6	51.8	44.9	59.6	36.6	53.4	43.1	59.4
Males	31.1	50.7	44.5	59.9	35.6	52.1	42.6	58.8
Females	34.2	52.9	45.3	59.2	37.8	54.9	43.7	60.0
Native	22.7	48.8	41.1	58.9	27.9	50.7	38.5	58.5
Males	21.5	47.6	40.4	59.4	26.9	49.7	37.8	58.5
Females	24.1	50.0	41.9	58.5	29.0	51.8	39.3	58.6
Both parents native	31.2	55.8	44.6	60.6	33.2	54.1	39.4	59.2
Males	29.1	54.6	44.2	61.1	31.4	52.9	38.2	59.3
Females	33.3	57.0	45.1	60.0	35.2	55.3	40.7	59.1
One or both parents foreign	13.0	36.9	20.1	43.0	19.5	43.3	23.9	48.2
Males	12.7	36.6	19.5	43.3	19.3	42.8	23.8	48.3
Females	13.4	37.2	20.8	42.6	19.7	43.9	24.1	48.1
Foreign	53.4	54.7	60.2	61.4	55.7	56.8	61.0	62.0
Males	52.6	53.9	60.5	61.6	54.2	55.2	59.3	60.2
Females	54.3	55.6	59.8	61.1	57.5	58.8	63.4	64.6
Colored	26.6	45.1	31.4	51.0	31.1	45.1	32.4	49.2
Males	26.3	44.9	32.3	52.9	31.2	44.8	33.6	49.7
Females	26.9	45.3	30.6	49.1	31.0	45.5	31.0	48.6

(a) Registration states in 1900 include Connecticut, District of Columbia, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island and Vermont and in 1910 also California, Colorado, Maryland, Minnesota, Montana, North Carolina, Ohio, Pennsylvania, Utah, Washington, and Wisconsin.

TABLE VI.

PERCENTAGE OF TOTAL NATIVE WHITE POPULATION OF SAME AGE AND SEX LIVING IN RURAL DISTRICTS IN 1910.

Age Group.	New England.		Middle Atlantic.		East North Central.		West North Central.		South Atlantic.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
Under 5 years...	16.4	16.2	30.3	30.3	51.2	50.9	74.0	73.8	79.4	79.1
5–9.....	17.8	17.6	32.7	32.2	54.2	53.6	74.8	74.4	79.5	79.1
10–14.....	18.6	17.7	33.0	32.1	54.7	53 2	74.3	72.9	79.1	77.9
15–19.....	18.6	17.1	32.7	30.1	52.4	49.1	71.4	67.6	76.3	74.3
20–24.....	18.2	16.5	30.8	28.3	48.0	44.8	66.0	62.4	71.8	70.2
25–34.....	19.7	18.0	31.3	29.9	47.4	45.8	63.7	62.1	69.7	68.8
35–44.....	22.1	20.1	34.6	32.7	51.3	48.9	64.7	62.1	70.2	68.4
45–64.....	28.2	25.2	43.0	39.7	58.2	54.2	67.3	63.8	74.5	70.8
65 and over.....	38.1	32.7	57.5	51.0	68.4	62.0	71.8	67.1	78.9	74.4
Total.....	21.2	19.7	34.5	33.8	52.8	50.4	69.4	67.4	75.2	73.6

Age Group.	East South Central.		West South Central.		Mountain.		Pacific.		United States.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
Under 5 years...	86.9	86.7	83.6	83.4	69.3	69.3	49.9	49.8	58.0	57.6
5–9.....	86.7	86.2	83.1	82.8	68.9	68.4	51.8	51.0	59.8	59.2
10–14.....	85.9	84.8	82.5	81.4	67.6	65.9	51.0	49.3	59.4	57.9
15–19.....	83.8	82.1	81.2	78.7	66.1	61.4	47.4	42.9	57.5	54.4
20–24.....	79.9	78.8	76.0	74.2	64.9	58.2	42.6	37.0	54.0	50.8
25–34.....	77.8	77.2	73.4	72.7	62.2	59.5	39.7	36.5	52.5	50.5
35–44.....	77.9	76.9	73.3	72.5	62.6	57.0	42.0	37.6	53.7	50.8
45–64.....	81.7	78.9	77 4	74.0	65.4	57.5	47.3	39.6	59.2	54.5
65 and over.....	86.8	82.9	80.0	75.6	67.5	56.1	54.3	41.1	66.4	59.8
Total.....	82.8	81.6	78.9	77.8	65.6	62.0	45.9	42.2	57.0	54.6

TABLE VII.

PERCENTAGE OF MALES IN THE TOTAL RURAL AND TOTAL URBAN NATIVE WHITE POPULATION OF THE SAME AGE IN 1910.

Age Group.	New England.		Middle Atlantic.		East North Central.		West North Central.		South Atlantic.	
	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.
Under 5 years...	50.6	50.4	50.6	50.5	50.9	50.5	50.7	50.5	51.1	50.6
5–9.....	50.6	50.3	50.6	50.2	50.8	50.2	50.7	50.2	50.9	50.3
10–14.....	51.5	49.9	51.1	49.8	51.1	49.7	51.1	49.3	51.4	49.5
15–19.....	52.1	49.4	51.5	48.5	51.6	48.2	51.6	47.1	50.6	47.9
20–24.....	51.0	47.9	50.4	47.4	50.9	47.6	51.8	47.9	49.6	47.8
25–34.....	50.5	47.7	49.9	48.3	50.5	48.9	51.9	50.2	50.0	48.8
35–44.....	51.4	48.4	50.8	48.7	51.7	49.4	53.3	50.6	51.6	49.4
45–64.....	52.2	48.3	51.4	48.0	53.2	49.1	55.2	51.4	53.1	48.4
65 years and over	49.3	43.4	49.5	43.0	52.7	45.6	54.7	49.1	49.2	42.9
Total.....	51.1	48.8	50.7	48.8	51.5	49.2	52.1	49.8	51.0	48.9

Age Group.	East South Central.		West South Central.		Mountain.		Pacific.		United States.	
	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.	Rural.	Urban.
Under 5 years...	51.1	50.7	51.0	50.6	50.6	50.6	51.0	50.8	50.9	50.5
5–9.....	50.9	50.0	50.9	50.3	50.8	50.2	51.0	50.3	50.8	50.2
10–14.....	51.4	49.3	51.3	49.5	51.5	49.6	51.4	49.7	51.2	49.7
15–19.....	50.7	47.7	51.1	47.2	52.6	47.5	53.0	48.5	51.4	48.3
20–24.....	49.2	47.5	50.8	48.4	56.7	49.6	56.3	50.5	51.0	47.9
25–34.....	50.0	49.1	52.0	51.2	57.7	52.9	56.5	53.2	51.3	49.3
35–44.....	51.4	50.0	54.1	53.1	59.3	53.6	57.7	53.2	52.6	49.8
45–64.....	53.8	49.4	57.6	53.0	63.4	55.4	60.5	52.8	54.3	49.5
65 years and over	51.4	43.8	54.3	48.0	63.5	51.7	62.9	49.9	52.2	45.1
Total.....	51.1	49.1	52.2	50.6	55.4	51.6	55.3	51.6	51.7	49.3

THE MOTHER AND INFANT MORTALITY.

By Henry H. Hibbs, Jr., *Sometime Fellow in Research, Boston School for Social Workers.*

Even the most hasty examination of almost any report on vital statistics will show how widely rates of infant mortality vary in different countries, states, cities, and other communities. This is a phenomenon of great significance to students of infant mortality because it brings us face to face with the question of causes. Why is the infant mortality rate lower in one country than in another, in one city of the same country than in another, in one ward or locality of the same city than in another? Thus, the wide variation in infant mortality in different areas and localities immediately challenges investigation into the relation of housing and living conditions, of sanitation and congestion, of rates of wages, and of social conditions in general, to the proportion of the infants born to those who die in such areas. In the same way any similar variation found to exist, when the infant death rates of a large number of families are compared, will suggest an inquiry into the relationship existing between the proportion of infant deaths in families and the age of the mother, the size of the family, the character and intelligence of the parents, and domestic conditions in general. It is with one phase of this aspect of the problem that this article will deal—the relation of the mother, her age, her character, her intelligence, and her knowledge of infant hygiene, to infant mortality and to her baby's health.

It is obvious that this variation in the proportion of infant deaths in families cannot be shown by the use of the usual infant mortality rate based on the proportion of deaths to 1,000 births because the number of both births and deaths in any family is too small for such a comparison. The only feasible method is the very indirect one of comparing the number of infant deaths that have previously occurred in families with the infant mortality rate for such families in any given year. If the families in which a large proportion of infant deaths have previously occurred contribute a larger number of deaths to the total infant mortality of the year in

question than those families in which no previous infant deaths have occurred, it will follow that in the former group of families infants tend to die in larger proportions than in the latter; or, in other words, that the proportion of infant deaths to births is year after year larger in some families than in others. This was the method followed in an investigation of infant mortality in Wards 6, 8, 13, and 17 of Boston by the Research Department of the Boston School for Social Workers.* The results of this phase of the inquiry are set forth in the following table where the mortality rate for infants born in 1910 and classified according to the number of infant deaths that occurred among the children previously born to their mothers is given—the number of previous children born into the family being taken into account by an additional classification of the mothers according to the number of their previous pregnancies:

TABLE SHOWING (A) NUMBER OF BIRTHS AND (B) DEATHS PER 1,000 BIRTHS IN 1910 IN FAMILIES VISITED IN BOSTON CLASSIFIED ACCORDING TO THE NUMBER OF DEATHS DURING INFANCY WHICH OCCURRED AMONG CHILDREN BORN IN PREVIOUS YEARS AND THE NUMBER OF THE PREVIOUS PREGNANCIES OF THE MOTHERS. (a)

Families Classified According to the Number of Deaths During Infancy Which Occurred Among Children Born Previous to 1910.	Families Classified According to the Number of the Mother's Pregnancies Occuring Previous to 1910.			
	Total.	1, 2, or 3	4, 5, or 6	Over 6
(A) NUMBER OF BIRTHS IN 1910 IN:				
All families (b)	1671	961	487	223
Families with no previous infant deaths	1192	807	297	88
Families with one or more previous infant deaths	479	154	106	135
Families with—				
One previous infant death	331	134	118	79
Two previous infant deaths	115	19	62	34
Three or more previous infant deaths	33	1	10	22
(B) DEATHS PER 1,000 BIRTHS IN 1910 IN:				
All families	134	126	126	146
Families with no previous infant deaths	117	114	125	125
Families with one or more previous infant deaths	173	188	179	148
Families with—				
One previous infant death	154	194	153	89
Two previous infant deaths	191	158	210	177
Three or more previous infant deaths	303	...	300	318

(a) This table is intended to show the relationship between the infant death rate in 1910 in the families visited and the infant death rate during previous years in the same families. Since it is not possible to compile a true infant mortality rate based on the ratio of deaths to 1,000 births for so small a unit as the family this double classification, according to the number of previous infant deaths and the number of the mother's previous pregnancies—this last being a rough approximation of the number of births—has been substituted.

(b) Information was not obtained in 21 instances. The 371 infants who were born during their mother's first pregnancy are omitted from this table.

* The writer is indebted to Dr. J. R. Brackett, director of the School for Social Workers, for the use of these figures which have not been previously published. The investigation was made in the academic years 1910–11 and 1911–12. During the second of these years the field work was carried on under the direction of the writer supervised by the director of the Research Department, Dr. T. W. Glocker.

An examination of this table shows that the rate of mortality for infants born to mothers, none of whose previous children have died during infancy, is strikingly less than the rate for those whose mothers have already had one or more infant deaths. Moreover, the rate rises as the number of previous infant deaths in the family increases and varies in the same manner when the infants are also classified according to the number of their mothers previous pregnancies.* The conclusion that infant mortality rates for families vary as widely as those for states and cities appears, therefore, to be justified. The table also shows that the rate of infant mortality in any community is determined, not by the relatively uniform occurrence of deaths in all families, but by their relatively frequent occurrence in certain especially unfortunate families, and that the high mortality rate for the period of infancy is to be laid at the door of these relatively few families where the proportion of infant deaths to children born is especially large.

This, however, is merely another way of saying that the proportion of infant deaths to births in families varies in the same way that it does in other divisions of the population. Having shown this—and it would probably have been admitted *a priori* by many— it will be necessary to study at length the nature of some of the domestic and social conditions which cause the regular occurrence of a high ratio of infant deaths to births in certain families, while others escape with a smaller proportion of deaths or none at all; and to ascertain, if possible, why in any district parents may be found who have successfully reared every member of a large family, while side by side with them are other families in which numerous infant deaths have occurred. Among these "domestic factors" of infant mortality one of the most important is the mother, her age, her health, her character and intelligence, and her devotion to the child.

The Influence of the Age of the Mother at the Birth of the Child. The relation of the age of the mother at the birth of her child to the rate of infant mortality has been frequently commented upon, though not always made the subject of careful study. It is often asserted on the one hand that young mothers, because their strength has not been depleted

* The one exception in the case of the mothers with one, two, or three previous pregnancies and two previous infant deaths is probably due to chance as there were only nineteen births and three deaths included in the group.

by previous childbearing or by the cares of a family, tend, other things being equal, to give birth to healthy children and that the rate of mortality among their infants is, therefore, very low. On the other hand, it is probably as often claimed that young mothers are too immature to give birth to healthy and well formed children and, in addition, often incapable through the lack of previous experience of giving them the needed care after birth, as a consequence of which the mortality among their infants is relatively high. The following table summarizes the data bearing on this aspect of the subject which have been collected in five recent investigations:

MORTALITY RATE PER 1,000 BIRTHS AMONG INFANTS INCLUDED IN FIVE INVESTIGATIONS, CLASSIFIED ACCORDING TO THE AGE OF THEIR MOTHERS.

Age of the Mother.	Number of Births.	Infant Mortality Rate.
Boston (Mass.) Investigation. (a)		
All ages	2,025	125
Under 21 years	145	90
21 to 25 years	559	109
26 to 30 years	573	131
31 to 35 years	440	132
36 to 40 years	241	149
Over 40 years	67	164
Fall River (Mass.) Investigation. (b)		
All ages	746	202
Under 20 years	29	103
20 to 29 years	386	189
30 to 39 years	257	206
40 and over	36	222
Unknown	38	—
Johnstown (Pa.) Investigation. (c)		
All ages	1,463	134
Under 20 years	95	137
20 to 24 years	454	121
25 to 29 years	391	143
30 to 39 years	449	136
40 years and over	74	149
Ewart's Investigation (England). (d)		
Under 19 years	152	171
20 to 24 years	536	132
25 to 29 years	396	166
30 to 34 years	316	170
35 to 39 years	150	220
Over 40 years	36	330
Birmingham (Eng.) Investigation. (e)		
All ages	3,773	176
Under 25 years	936	207
25 to 35 years	1,982	167
35 years and over	855	163

(a) No information was obtained in 38 instances. For source of data see first note.

(b) Dublin: Infant Mortality in Fall River, Mass.—A Survey of the Mortality among 833 Infants Born in June, July, and August, 1913. *Quarterly Publications* of the American Statistical Association, New series, No. 110, June, 1915, p. 515.

(c) U. S. Children's Bureau: Infant Mortality: Johnstown, Pa., Washington, 1915, p. 35.

(d) R. J. Ewart, M. D.: The Aristocracy of Infancy and the Conditions of Its Birth. The *Eugenics Review*, Vol. III, p. 166. The writer does not state where his data were collected but from a later article in the same journal it is to be inferred that they were collected in Middlesborough, England.

(e) Health Department of the City of Birmingham, England: Report on Industrial Employment of Married Women and Infant Mortality, 1911 (p. 11) and 1912 (p. 11).

Interpretation of the data presented in this table is somewhat difficult because of the complex factors involved and because the results of the five investigations differ considerably. In the first two, Boston and Fall River, the rate of mortality was lowest for the infants born to the very young mothers under 20 and 21 years of age. In both also the rate increased regularly with the age of the mother after the twentieth year, the highest rate occurring among the infants whose mothers were over 40. In two others, Johnstown and Ewart's, the rate was higher for the children of the very young mothers under 19 or 20 than for those whose mothers were between the ages of 20–30 and 30–35 years. These two investigations agree with the first two, however, in showing that the rate is highest of all among the infants whose mothers were 40 years of age or over. Finally, when the figures for Birmingham are examined, exactly the opposite tendencies are revealed, the rate for the older mothers being lower than that for the younger.

There seems to be a general agreement in the results of the first four of these investigations in showing that the chances of survival are greater for infants born to mothers between the ages of 20–25, and 35–40 than for those born to mothers over 40. The results for Birmingham do not share in this agreement but in interpreting these figures the fact must be considered that no separate data were given for the very young mothers under 20 or the very old mothers over 40 years of age. The results of the five investigations are not in sufficient accord to justify any conclusion as to the rate of mortality among the infants of very young mothers. This question must, therefore, be left in doubt—at least as far as the available statistics are concerned.

On the other hand, in drawing conclusions from these figures the mere fact that the results of the five investigations differ is in itself significant. It indicates, in the writer's opinion, that the age of the mother is not a factor in infant mortality of primary importance. The figures do not show that mothers can obtain the knowledge necessary for bearing and rearing babies only from experience acquired with age. In fact, except for the very young mothers, these figures seem to show that, as far as infants are concerned, one may fairly

expect as high a degree of efficiency in motherhood from the young and inexperienced mothers as from the older—a conclusion which from the standpoint of prevention it is not necessary to point out.

The Influence of the Character and Intelligence of the Mother. But if the age of the mother is not a factor in infant mortality of primary importance, her health, her character, and her intelligence certainly are. It is difficult for the careful student of this problem to avoid the conclusion that the real underlying factor of infant mortality and the chief consideration in the health and welfare of babies is the strength, character, health, and intelligence of the mother. For instance, it is the mother's health and strength that determines whether it is physically possible for the baby to start life with the tremendous advantage that comes from breast feeding and it is her character and intelligence that largely determine how the child shall be fed when either method is possible Again, in the recent campaign that has arisen for the control of the influence of prenatal conditions on infant mortality it is evident that the mother is the all-important consideration. Certainly, while the child is developing in the mother's womb her health and strength, the care she takes of herself, and her general standards of hygiene are among the most important considerations in determining whether or not the baby after its birth will get a fair start in life or die in a few weeks or months from prenatal causes.*

But even after the physical connection between mother and child is severed at birth the infant is little less dependent upon its mother, for she determines to a very large extent the character of everything with which it comes into contant—food, sunlight, cleanliness, and even the kind of air it breathes. In both the Boston and Johnstown investigations a close relationship between bad housing conditions and infant mortality was found to exist, but it should not be forgotten in interpreting these figures that the closeness of this relationship is also to a large extent determined by the mother.† From even the briefest investigation it will be evident that even in the

* See the writer's article on "The Influence of Prenatal Conditions on Infant Mortality," Proceedings of the Southern Sociological Congress, 1915.

† See the writer's article on "Infant Mortality and Urban Housing, and Living Conditions," *Journal of Sociologic Medicine* (American Academy of Medicine), October, 1915.

poorest districts, where the housing and living conditions are exceedingly bad, many instances in which parents have reared large families without the occurrence of a single death are to be found, while side by side with these in the same neighborhood or even in the same house are to be found other families in which numerous deaths of infants have occurred. Such instances as these, where other differences between the families concerned appear to be so small, seem logically to be the result not of poverty, or the cleanly or sanitary condition of the home, or even of the physical strength of the parents, but of the amount of intelligent attention and care which the mother bestows upon her baby. In such cases it is not only the "resistance of the child" but the "resistance of the mother" that determines the extent of the influence of the other factors on the problem.

The influence of the character and intelligence of the mother on the rate of infant mortality is exceedingly difficult to measure statistically. It is especially difficult to distinguish this influence from that of the other closely related factors and one can never feel certain that the desideratum, "other things being equal," has been reasonably well attained. It is not to be expected, therefore, that the relationship between the character and intelligence of the mother and the rate of infant mortality can in the nature of the case be so accurately measured as to show the extent of the influence of the former on the latter, although the application of the statistical method does show the existence of such a relationship.

Thus, in the Boston investigation it was found that of the 341 mothers, upon whose general intelligence and standards of child care the investigators felt competent to express an opinion, the rate of mortality (99.6) was lower for the 254 infants of whose mothers a favorable opinion was given than the rate (103.4) for the 87 infants whose mothers were criticised unfavorably. These figures are of somewhat doubtful value, however, as they are based on an opinion formed upon only one visit and include only the somewhat extreme cases upon each end of the scale, all the other mothers in between being omitted, as the investigators did not feel competent to express an opinion upon them. A similar attempt

was made by Dr. Schwarz to grade the mothers coming under the observation of the New York Free Out-Door Maternity Clinic according to their general intelligence, which was more successful, as it was based on a much larger number of cases. Thus, among 2,326 infants whose mothers were rated as unsatisfactory in general intelligence the rate of mortality was 126 deaths per 1,000 births in comparison with a rate of 100 for the 210 infants whose mothers were rated as satisfactory in this respect.* These figures are also of doubtful value as the standard of intelligence used must have been high to have excluded such a large proportion of the mothers from the satisfactory grade.

A number of attempts have also been made to show the relationship of the intelligence of the parents to infant mortality in which literacy is used as a test of intelligence. Thus, Dr. Schwarz, in the study referred to above, shows that the rate of mortality among 1,297 infants, both of whose parents were literate, was 111 deaths per 1,000 births, while among 702 others, only one of whose parents was literate, the rate was 113, and among 458, where both were illiterate, it was 172.† In a similar manner it was shown in the Johnstown investigation that the rate of mortality was higher among infants born to foreign-born mothers who could not read and write any language or who could not speak English than among those infants whose mothers could meet these tests. Thus, of the 229 mothers who could not read and write, the infant mortality rate was 214, while among the 419 mothers who could read and write it was only 148. Among the 401 infants, whose mothers could not speak English, the mortality rate was 187 in comparison with a rate of 146 among those whose mothers could speak English.‡ In so far, therefore, as literacy and ability to speak English are indices of intelligence these figures indicate, though probably not adequately, the heavy handicap under which babies are placed because of a lack of intelligence on the part of their mothers.

* First Annual Report of the Free Out-Door Maternity Clinic, Covering the First Nine Years of the Clinic's Experience. New York, 1910; Chapter 2, Part 2, Report of the Pediatric Department, with a Study of Early Infant Mortality, by Herman Schwarz, M. D., p. 41.

† Loc. cit., p. 39.

‡ U. S. Children's Bureau: Infant Mortality: Johnstown, Pa. Washington, 1915, p. 34.

Other writers have shown the existence of this relationship between literacy and infant mortality by correlating the percentage of illiteracy and the rate of infant mortality in a number of cities. For instance, Phelps, in his recent study of the relation of infant mortality to the employment of mothers, concludes, after a careful examination of the available statistics for the cities and states of New England and especially of the cities of Massachusetts, that a high female illiteracy is "with fair uniformity coexistent with a high infant mortality rate." * Newman also notes the relationship from a study of English figures, although he does not find it to be as close as the writer just cited.†

On the whole, however, the extent of the influence of the character and intelligence of the mother upon infant mortality is not capable of statistical demonstration or of exact measurement by any method so far devised. Nevertheless observation and experience show that it is an all-important factor in the problem—the underlying factor which determines to a great extent the influence of other measurable factors. In conclusion, therefore, it may be said of this article, as Dr. Newman says of his own excellent work on the subject:

> This book will have been written in vain if it does not lay the emphasis of this problem upon the vital importance to the nation of its motherhood. Wherever we turn, and to whatever issue, in this question of infant mortality, we are faced with one all pervading need—the need of a higher standard of . . . motherhood. Infant mortality in the early weeks of life is evidently due in large measure to the physical condition of the mother, leading to prematurity and debility of the infant; and in the later months of the first year infant mortality appears to be due to unsatisfactory feeding of the infant. But from either point of view it becomes clear that the problem of infant mortality is not one of sanitation alone, or housing, or indeed of poverty as such, but *is mainly a question of motherhood.* No doubt external conditions as those named are influencing maternity, but they are, in the main, affecting the mother, and not the child. Improved sanitation, better housing, cheap and good food, domestic education, a

* Edward B. Phelps: Infant Mortality and Its Relation to Woman's Employment—A Study of Massachusetts Statistics. In Volume XIII, Part 1, of the Bureau of Labor's Report on Condition of Woman and Child Wage Earners in the United States, p. 48.

† George Newman, M. D.: Infant Mortality. London, 1906, p. 222.

healthy life of body and mind . . . exert but an indirect effect on the child itself, who depends for its life in the first twelve months, not upon the state or the municipality, nor yet upon this or that system of *creche* or milk-feeding, but upon the health, the intelligence, the devotion and maternal instinct of the mother. And if we would solve this great problem of infant mortality, it would appear that we must first obtain a higher standard of . . . motherhood. Without a moment's hesitation I place this need as the first requirement. Other things . . . are important, but this is the chief thing.*

To this conclusion the present writer heartily subscribes. The most important factors in infant mortality are the strength, the health, the character, and intelligence of the mother.

Preventive Methods: Education for Parenthood. Space would not permit, even if such a thing were possible, an enumeration of all the agencies and influences in modern life which are helping to raise the standard of motherhood or of all those other agencies and influences which are helping to lower it. It will be desirable, however, to conclude this discussion of the relation of the mother to infant mortality with at least a brief survey of some of the chief methods whereby the standard of motherhood, and also of fatherhood, may be raised. Probably the most important of these methods is education—the instruction and training of mothers and potential mothers in the care and rearing of children.

In a recent pamphlet, issued by the Children's Bureau on Baby-saving Campaigns, the methods employed by certain American cities in the prevention of infant mortality were pointed out—the work of health departments, registration of births and deaths, provision of a pure milk supply, milk stations and baby clinics, encouragement of maternal feeding, "little mother leagues" and classes, visiting nurses, prenatal work with expectant mothers, improvement of housing and living conditions, fight against flies, garbage accumulation, and dust, fresh air camps and hospitals, educational work through the distribution of circulars, pamphlets, etc.† A

* Ibid, pp. 257–258.

† U. S. Children's Bureau: Baby Saving Campaigns. Washington, 1911. See table of contents.

careful examination of each of these methods of preventing infant mortality will at once reveal to what a large extent each depends for its effectiveness upon the mother. At first sight it would appear that the chief function of a milk station is to provide cheap and pure milk and yet, as the report just referred to points out, "it has been the experience of practically all milk dispensaries that it is useless to send pure, clean milk into a dirty home to be handled by an ignorant, dirty mother or older child. It is necessary to reach the mothers, and not only teach them how to care for the baby's milk, but to convince them of the necessity of cleanliness. . . . In many cities it is believed that the principal good to be derived from milk stations consists in the opportunity given for those in charge to come in contact with the mothers and with the home surroundings. . . . Many cities place practically all the emphasis upon visiting nurses and the instruction of the mothers in the homes." * Dr. Josephine Baker, director of child hygiene of the Department of Health of the City of New York, also expressed the same idea in an address before the International Congress of Hygiene and Demography at Washington in 1912: "Without overlooking the value of pure milk, I believe this problem must primarily be solved by educational measures. In other words, the solution of the problem of infant mortality is 20 per cent. pure milk and 80 per cent. training of the mothers. The infants' milk stations will serve their wider usefulness when they become educational centers for prenatal instruction and the encouragement of breast feeding and teaching of better hygiene." †

In the case of visiting nursing, it is, of course, not necessary to point out that it is the function of such nurses not to care for the child themselves but to instruct the mother in the proper care of children.

Recently the work of visiting nurses has been extended to include the instruction of expectant mothers during the period of pregnancy. This "prenatal care," as it is often called, is

* Prev. cit., pp. 22–23, and 32.
† Transactions, Vol. 3, p. 149.

one of the newest and one of the most important direct means of reducing infant mortality by the education of the mothers, for the instruction is begun not after the child is born but soon after it has been conceived.

Finally, among the methods of instructing mothers in the proper care of children after the birth of the child or after conception, should be mentioned the educational work that is being carried on through the distribution of circulars, pamphlets, etc., on the care of infants and children as well as upon general hygiene and health. The volume of such publications, as well as the character of the material and the method of presentation and distribution, is improving rapidly. State and city boards of health and many private societies and associations have issued many exceedingly valuable pamphlets written in such a way as to appeal effectively to the mothers interested. Some of these have been printed in foreign languages as well as in English. The Federal Public Health Service and the Children's Bureau have also issued similar publications. The latter bureau is issuing a Care of Children Series, two numbers of which have already appeared. The first, "Prenatal Care," deals with the care of mothers during pregnancy, while the second, "Infant Care," gives the mother specific instruction as to the care of the baby after birth. Both of these pamphlets are written in popular, non-medical terms and are admirably suited to their purposes.

The trouble with the publications of the Children's Bureau, as well as those of the Public Health Service, is that the amount of funds available has heretofore been so small that they have not been as widely distributed as they should be. If these bulletins on the care of children, for instance, were as widely distributed as the Department of Agriculture's very successful series of Farmers' Bulletins, we should feel more confident that the government is doing its part in the prevention of infant mortality than is possible at present. On the other hand, the work of many city health departments has not been so limited by a lack of funds. In a number of cities educational pamphlets and folders are sent to each mother upon the registration of the birth of the child, either through the

mails or by the hands of a visiting or health nurse. Effective use has also been made of newspapers for the instruction of mothers in a number of cases.*

But this instruction of mothers in the care of themselves during pregnancy and of their babies after their birth is not the only means of reducing infant mortality by means of education. This kind of instruction may be called *instruction or education of parents;* but there is another kind of education that begins at childhood and which may be called *education for parenthood.* To say that "our educational system needs revision and that it should be made to conform more nearly to the actual requirements of our complex daily life" is merely to repeat a statement that has been made many times already; and yet there can be little doubt that one of the most effective means of lowering the rate of infant and child mortality, as well as the general death rate for all ages, would be the education of children and young men and women for parenthood. Just how much of this education should be given in the home and how much in the schools, and just how much should be obtained by the study of the laws of health and hygiene or by the study of domestic science and home management, it is impossible to say at present. What can be said at present is that the need of education for parenthood cannot be denied and that, in the overhauling and revision of our system of education which is going on at present, efficient methods for meeting this need must be worked out.†

But education for parenthood should include more than instruction in the science and art of infant and child care, or in home management or even in the ideals of parenthood; it should also include instruction, direct or indirect, in "the selection of parents." To take the case of the girl, for instance, education for parenthood,

* U. S. Children's Bureau: Baby-saving Campaigns, pp. 44–45 and Appendix.

† One of the most interesting of the recent attempts to instruct and educate children directly in the care of babies and in the laws and rules of infant hygiene has been carried on by the Department of Health of the City of New York in its lectures and classes for the "little mothers" who attend the city schools. Little Mothers' Leagues have also been organized which have reached a membership of over 17,000. These leagues were described by Dr. Baker in her address before the International Congress of Hygiene and Demography previously referred to. The idea has also been put in operation in other cities. Another movement of the same kind that should at least be mentioned is the establishment of continuation schools for homemaking.

instead of concerning itself with the care of her baby, will be at work when she is choosing the baby's father. In all times and places, woman's primal and supreme function is or should be that of choosing the father of the future. This great idea should be recognized, implicitly and explicitly, in the education of every girl; she is or may be partly responsible for the future of mankind. She herself, mind and body, is holy, for she is the temple of the life of this world to come. She must honor and care for herself accordingly; and this twofold aspect of her present and future duty, in caring for herself and in choosing her co-creator of the future, must be instilled into her mind with the solemnity, the sanctity, and the authoritative sanction of a religious dogma. *

This quotation, in suggesting how the standard of parenthood may be raised by eugenics, both on its positive side of the encouragement of the marriage of the fit and on its negative side of the discouragement or prevention of the marriage of the unfit, the unhealthy, and the weak, opens up an interesting field for discussion but one which, even if space would permit, it would hardly be proper for us to enter upon here.

* Saleeby, C. W.: The Methods of Race Regeneration. New York, 1911, p. 36.

MEASURES OF RELATIVE TAX BURDENS.*

By A. E. James, *Santa Fé, New Mexico.*

The larger problems of methods of taxation are receiving attention at a gathering of tax experts meeting in conference simultaneously with the gathering of this association. In their major deliberations the statistician has only a minor part. His duty is not so much to devise methods of reform as to measure the need of it—to point with the certain finger of fact to the weak spots in the present structure.

When the Committee on Tax Revision of the commonwealth of Virginia met to deliberate on the reforms it should recommend to the legislature whose creature it was, it felt imperatively the need for such guidance. The demand which had called such a body into being was primarily the product of disputes and recriminations between sections of the state, classes of its social and economic organization, and owners of its groups or kinds of property. Tidewater, Piedmont, Valley and Southwest, and the cities each claimed the others were tax dodgers and worse; the farmer and the merchant, the miner and the banker each was (in his own story and honestly-held opinion) the unjust bearer of his neighbor's burden; land and fluid capital, the widow's cow and the opulent railroad each groaned (so its owner said) under the intolerable discrimination of the tax system as administered by the officials of the commonwealth.

The committee held hearings. Each section, class, and group appeared, urged its grievance, and made its plea. But the taxpayer, whatever his honest convictions, usually found when forced to make his case that his facts were as few as his convictions were positive. The committee found that, if it listened to all pleas and took them at their face value, it would have to lower all taxes on everyone.

Here was the proper field for the statistician. All these claimants could not be right. The writer was employed to

* Paper presented at the meeting of the American Statistical Association, Stanford University, California, August 13, 1915.

endeavor in the short time at the disposal of the committee to find facts on whose general significance it could rely.

In undertaking this study the writer was confronted first with the limitation as to time. The entire work was to be completed between June 15 and November 1, 1914. The survey of the field must be rapid; it must also be reasonably accurate in its general results. It must cover the large items of taxable units in a large way and be content with that result. These units, as shown by the last preceding assessment, were as follows:

Item.	Assessed Value.	Per Cent. of Total.
Real estate	$550,421,094	56
Tangible farm property	44,382,756	5
Other tangible personal property	58,595,348	6
Banks	51,123,050	5
Railroads	109,310,445	11
Other public utilities	30,088,941	3
Intangible personal property	141,967,315	14
Total	$985,888,949	100

It is at once apparent that the first question relates to real estate. Is real property assessed at an equitable proportion as compared with other property, is it equitably assessed as between sections of the state, as between city and county, as between owners in the same locality?

At the outset it became necessary to assume two important propositions which a purely academic thesis could not assume: (1) that "equitably" meant equitably before the law and (2) that a tax meant any impost which must fall upon the property or the person because of the ownership of such property. The latter assumption was of prime importance in dealing with railroads and with certain other classes of taxpayers as we shall later see.

Two ways are possible to measure the ratio of realty assessments; a re-appraisal, and an examination of recorded sales or transfers. Obviously the former was impossible to us; the latter was the only choice. Conditions, moreover, made this a very easy method of practical application. A full sales report was on file with the state auditor; the detailed tax books were likewise on file in that office. The sales reports were first

edited to eliminate improper items; trades, transactions between relatives and nominal deals, sheriffs', executors', and guardians' sales, old deals lately recorded, deeds other than full warranties, etc. The comparison was restricted to a single year. After the first editing the sales remaining were copied on cards, then sorted and compared with the tax records for the entry of the assessed valuation. Thereupon a further editing was necessary to eliminate items not furnishing a comparable assessment. Thereupon the data were ready for tabulation.

The facts to be gleaned from tabulation were as follows—ratios of assessed to true values:

1. Between counties;
2. Between rural and urban property;
3. Between different classes of taxpayers in the same taxing district.

To bring out these facts the cards were sorted first into the one hundred counties and nineteen cities into which all Virginia is divided. Thereafter a division was made into platted and acreage property. For each of these grand divisions a composite tabulation form was made up classifying the sales first by white and colored ownership and second by the size of consideration paid for the property. The total assessments and considerations so tabulated and aggregated would make possible comparisons:

1. Between counties;
2. Between land and lots;
3. Between colored and white;
4. Between owners of large and small properties.

The results secured were interesting and conclusive. Speaking generally, the cities were assessed more nearly at true value than the country; Tidewater more than the interior; the Southwest mountain country was assessed the lowest of all. The inequalities ranged from a ratio of 12.5 per cent. in Carroll county to 76.5 per cent. in Fredericksburg City. Lots in counties were assessed on the average at 38.5 per cent. and lands in the same counties at 30.2 per cent.

As between large and small properties, the following table illustrates very well the inequality too often visited upon the small taxpayer:

TABLE I.

REAL ESTATE ASSESSMENTS AND SALES IN COUNTIES.

Value of Property.	Number of Sales.	Total Assessment.	Total Selling Price.	Ratio, Per Cent.
Total	16,362	$7,929,415	$23,666,730	33.5
Under $500	7,683	718,187	1,536,634	46.7
$500–$1,000	2,965	776,978	1,992,607	39.0
1,000– 2,500	3,219	1,791,904	4,924,387	36.4
2,500– 5,000	1,574	1,714,282	5,241,605	32.7
5,000–10,000	635	1,285,946	4,127,999	31.1
Over $10,000	286	1,642,118	5,843,498	28.1

REAL ESTATE ASSESSMENTS AND SALES IN CITIES.

Value of Property.	Number of Sales.	Total Assessment.	Total Selling Price.	Ratio, Per Cent.
Total	4,431	$6,475,430	$12,215,456	53.1
Under $500	921	143,974	241,443	59.8
$500–$1,000	835	335,129	575,904	58.2
1,000– 2,500	1,280	1,173,217	2,080,856	56.5
2,500– 5,000	856	1,555,122	2,776,501	56.0
5,000–10,000	361	1,263,713	2,383,685	53.0
Over $10,000	178	2,004,275	4,157,067	48.2

The foregoing table also points the way of reform. The inequality *among taxpayers* is far more vicious than that among *sections*, since the former applies to *all taxes*, the latter only to the relatively small state tax. Since, therefore, equality among taxpayers is the most necessary and since the higher assessment in cities was also accompanied by greater uniformity the first step in reform indicated by the statistics was a general increase in the ratio of assessed to true value.

The figures for colored and white owners were interesting, but for obvious reasons were not published by the committee. On their face they showed that colored owners were assessed more severely then their white neighbors. A more careful examination, however, revealed the fact that this result was due mainly to the smaller size of the properties owned by negroes. Within the same size groups the colored property was assessed somewhat higher than the white, but the average size of property within the groups was also less. I personally con-

cluded that the apparent discrimination against the Negro was due to economic rather than racial causes.

Turning from what we may call the internal comparison of real estate values to the external comparison, or, in other words, that of real with other property, we first considered tangible personal property.

No such easy measure and no such certain standard of value is available anywhere respecting personal property as is easily at hand in the case of real estate.

In the first place, while the entire omission of real estate is not unknown in states like Virginia, it is of infrequent occurrence. Not so with movable property; horses, cattle, sheep, swine, farm implements, merchants' stocks, manufacturers' stocks and equipment are all not merely subject to undervaluation, but to entire omission as well.

The United States Census was not used in dealing with real estate for the plain reason that better measures were available. In the case of personal property the census of farm property had to be used, compared with the assessed value of the same kinds of property, and from that basis an estimate made of the entire value of tangible property. As the same assessor valued all the items so estimated and would naturally try to do some measure of comparative justice it is possible that the error in these computations was within reason. The following table sets forth the final result of these estimates:

TABLE II.

VALUES OF TANGIBLE PERSONAL PROPERTY.

Classes of Property.	Numbers.		Values.		Average Values.		Ratio of Assessment.
	Assessment 1913.	Census 1910.	Assessment 1913.	Census 1910 and Estimated.	Assessment 1913.	Census 1910.	
Value of tangible property, all classes	.....	.....	$102,978,104	$220,300,380	.....	.....	46.80
Values of tangible property, classes not reported by census..	.....	.....	58,595,348	(estimated) 124,156,200 (Census of 1910)	.....	.....	47.20
Values of tangible property, classes reported by census ...	.....	.....	44,382,756	96,144,180	.....	.....	46.20
Horses, mules, etc..	393,273	433,837	26,784,959	48,063,529	$168.20	$110.90	55.80
Cattle.....	656,010	895,728	12,070,666	22,202,253	18.40	24.80	54.30
Sheep and goats...	339,218	787,595	1,011,858	3,340,087	2.99	4.24	33.30
Hogs.....	465,808	836,406	1,584,227	4,402,428	3.41	5.27	36.00
Farm machinery ..	.....	.....	2,931,36	18,115,883	.....	.....	16.19

The ratio of assessed to true value for real estate was 38.5 per cent., the ratio for *tangible* personal property was 46.8 per cent. Concerning this fact the report of the committee says:

> The following conclusion can be drawn relative to the taxation of tangible personal property. This property on the whole is somewhat better assessed than is real estate, a fact not always clearly brought out in reports relative to taxation. Many writers have visited upon tangible personal property the odium very properly borne by the assessment and taxation of intangible personal property. As a matter of fact, tangible personal property partakes very largely of the condition of real estate. It is in view and most of it can be counted. It is available for appraisal in quantities whose values are fairly well known to the average man. The opportunities for under-assessment are rather less than those for the undervaluation of realty. The main defect of the assessment of tangible property arises rather from the failure to list the property at all than from the failure to list it at a reasonable value.

The same sectional inequalities found in real estate were likewise apparent in the ratios for tangible personal property. Warren county showed the lowest assessment, 23.3 per cent., Southhampton county the highest, 75.25 per cent. In round figures, horses averaged for the state $68 per head as assessed and $111 true value, cattle $18 and $24, sheep $3 and $4.25, hogs $3.40 and $5.26; farm machinery was assessed at $2,931,-036 and the reported true value was $18,115,883.

The estimate for tangible personal property, not enumerated in comparable form, was a somewhat doubtful procedure. Table II shows that the total assessed value of the comparable items was $44,382,756, and of the items not comparable with any census estimates, $58,595,348. The estimate of the true value of this large total was based upon the ratio in each county and city of the comparable items. One factor in favor of this procedure has been mentioned—the same assessor values all of the tangible schedule in Virginia.

Next to be considered and next in importance were the railroads.

The Virginia system of taxing railroads comprises:

1. A gross earnings tax of 1 per cent., the share of total

gross earnings accruing in the state being estimated on the basis of single track miles of main line.

2. The regular property tax imposed upon the real and personal property. The assessment is made by the corporation commission and apportioned among the counties, cities, and towns through which the roads operate.

To test the fairness of the above taxes it was necessary to measure:

1. The underassessment of railroads on a commercial basis.
2. The tax rate on full value taking account of the super gross earnings tax.
3. The average true value tax rate on other or comparable property.

Considering the last computation first it seemed best to make the comparison between railroads and real estate, for the reason that public service corporations should probably be equated with that class of property which forms the main basis of the revenue system. By dividing the tax imposed by all civil divisions upon real estate [(state $1,927,602.29, counties, cities and magisterial districts $6,006,352.93, towns $293,-537.38, total $8,227,492.60) by the true value already determined as described above (counties $976,698,395, cities $451,164,000, total $1,427,862, 395)] the real estate average tax rate was computed at 58 cents on the $100 of true value. By the extent to which the average for all railroads exceeded or fell short of this average it might be assumed that the roads were over- or under-taxed, ignoring for the moment questions of weighting.

The commercial values of the Virginia roads were computed on the stock and bond basis except where quotations were lacking. In such cases estimates were made upon the balance sheet and income account records as shown in the reports to the corporation commission. On the whole I personally lean toward the stock and bond method where the assets and income of the roads are based almost wholly (as is the case with the Virginia roads) on the operating property. The only danger is that the method will over-value the roads. Where the values so secured are to be contrasted with sales values of real estate which capitalize fully future prospects, I do not regard this as a serious objection.

The apportionment of the values computed for the system as a whole to the state of Virginia was made on the basis of net operating revenues as reported by the several roads for that state. While these reports were not made on a uniform basis it was not believed that this lack of uniformity produced any very considerable errors, particularly since the figure to be used was a proportion of Virginia net earnings to total net earnings, and only very substantial errors could materially affect the results.

The value estimated for the interstate roads was $357,333,700 and the taxes levied thereon were $2,227,026.15. This amounted to a rate of 62 cents on $100, or 4 cents in excess of the real estate rate. It was apparent, therefore, that the system was at least demanding sufficient revenue in total from the railroads. As between roads it was exceedingly unequal, the largest road paying 65 cents and three important properties only 38 cents, due in part to the arbitrary method of prorating gross earnings.

The study would have been more fully extended into individual localities, had time permitted, with a view to demonstrating local inequalities where the property locally assessed was appraised either higher or lower than the corporate prop-

TABLE III.

TAX STATISTICS OF ELECTRIC RAILWAYS AND LIGHT AND POWER OPERATIONS IN CONNECTION THEREWITH, YEAR ENDING JUNE 30, 1913.

Companies.	Taxes to $100 Stock and Bond Valuation.	Real Estate Tax on $100 True Value in Same Territory.
Appalachian Power Company (Interstate)	$2.26	$0.23
Blue Ridge Light & Power Co. (Staunton)	.93	.64
Charlottesville & Albemarle Rwy. Co.	1.33	.46
Danville Traction & Power Co.	.62	1.09
Lynchburg Traction & Light Co.	.72	.87
Mill Mountain Incline, Inc. (Roanoke)	1.06	.40
Newport News & Old Point Rwy. & Elec. Co.	.65	.69
Norfolk City & Suburban Rwy. Co.	3.92	.45
Radford Water Power Co.	1.22	.96
Richmond & Chesapeake Bay Rwy. Co.	2.71	.37
Richmond & Henrico Rwy. Co.	8.10	.93
Richmond & Rappahannock River Rwy. Co.	.54	.52
Roanoke Railway & Electric Co.	.58	.67
Tazewell Street Rwy. Co.	.52	.30
Virginia Railway & Power Co.	.76	.82
Total	$0.83	.....

erty assessed by the state corporation commission. This study was not made.

Minor public utilities were assessed, like the railroads, by the corporation commission and paid taxes to the local communities. The true test of their tax was not, of course, the general state average tax rate, but the true rate of the city or town in which they operated.

The danger of central assessment not closely associated with the local tax system was illustrated by the comparative rates for the principal companies. It should be noted that the Appalachian Power Company owned its main properties in Carroll county which county had the doubtful distinction of having the lowest assessment ratio in the state. As a result the valuation of the company for taxation was out of all decent proportion to the just value.

The analysis of bank taxation brought to light wholly undreamed of conditions of local assessments. The Virginia system calls for a report in duplicate—one to the state auditor and one to the local commissioner of the revenue—showing the book value of bank stock less real estate. The auditor collects the state tax directly from the banks; for the local tax they are placed on the local rolls. A special schedule sent to the banks showed taxes paid wholly at variance with the known factors—the book value and the local tax rate. It soon developed that a gentleman's agreement existed in many places under which the formal report was ignored and a more "equitable" one substituted. One county had even by resolution of the local board undertaken to exempt the banks therein from *all* local taxes—and the banks paid none.

Although the banks, despite these facts, were believed to be overtaxed, the committee felt a certain amount of such extra burden justifiable. The effort in this study was not to equate the bank tax with the tax on real estate, but to adopt a flat tax on all banks, granting a substantial but not a great reduction. The average tax on true investment was found to be $1.53 per $100; a reduction to $1.35 was recommended.

The shortness of the time forbade two investigations which I feel Virginia should certainly make. No careful study has

ever been made of the license system common to the whole South either from the economic or revenue aspects. The real burden of that system of taxing business is unknown either in terms of property or of income. An effort was made to secure such data, but the response was not satisfactory and the shortness of the time forbade further effort. The slight study made seemed to show that the system, while grossly evaded, was probably no worse in that respect than the property tax and was on the whole more certain of collection and less burdensome when once adjusted.

In one field no investigation was attempted at all. This was a study of the effect of the tax on intangible property. A glance at the table at the beginning of this paper will show that the assessment of this class of property is probably more nearly adequate in Virginia than in most states. This is due wholly to systematic record searching by a special appointive official—the examiner of the records. A comparison of appraisals of probated estates with the assessment books next preceding death would have been a valuable contribution to our knowledge as to the quantity of intangible property escaping taxation even where (judging by totals) it is most effectively reached.

The final study of general interest undertaken dealt with the taxation of insurance companies. In Virginia three overlapping taxes are imposed on insurance: (1) the tax on gross insurance premiums, common to most states; (2) an annual state corporation fee, heavy enough to be a material burden on some companies; and (3) municipal licenses in the form of an occupation tax on the business of the companies. Some of these municipal exactions are as high as $200 per company. Naturally since the licenses were not based upon property owned or business transacted they proved a serious burden upon small and new companies. Indeed the total burden was heavy upon all. This study was, therefore, directed to a comparison of premium income and taxes in Virginia. To equate insurance taxes with property taxes the admitted assets of the companies were apportioned to the state on the basis of premium income.

TABLE IV.

INSURANCE COMPANIES CLASSIFIED TO SHOW RELATIVE BURDEN OF VIRGINIA TAXES ON LARGE AND SMALL COMPANIES.

TOTAL OF ALL COMPANIES.

Classes on Basis of Premium Income.	Number.	Virginia Premium Income.	Virginia Taxes.	Percentage of Taxes to Income.
Total all classes	173	$17,841,560	$440,784.74	2.47
Under $10,000	20	103,898	8,777.42	8.45
$10,000–$24,999	30	500,043	26,236.95	5.25
25,000– 49,999	48	1,744,481	75,135.32	4.31
50,000– 99,999	35	2,436,417	81,508.14	3.35
100,000–199,999	17	2,120,234	49,000.09	2.31
200,000–299,999	10	2,408,577	52,869.25	2.19
300,000–499,999	5	1,867,172	32,328.66	1.73
500,000 and over	8	6,660,738	114,928.91	1.72

FIRE AND MARINE.

Total all classes	94	$4,984,824	$211,484.30	4.27
Under $10,000	8	48,756	4,687.41	9.61
$10,000–$24,999	20	3,311,914	19,889.21	6.42
25,000– 49,999	32	1,160,673	59,308.50	5.12
50,000– 99,999	23	1,500,231	63,175.63	4.21
100,000–199,999	6	787,133	25,274.96	3.21
200,000–299,999	5	1,176,117	39,148.59	3.33

LIFE.

Total all classes	36	$9,026,399	$169,793.48	1.89
Under $10,000	2	3,345	856.42	25.62
$10,000–$24,999	4	81,359	2,365.15	2.91
25,000– 49,999	9	344,928	8,777.58	2.54
50,000– 99,999	4	324,958	6,785.68	2.04
100,000–199,999	5	615,576	11,652.58	1.89
200,000–299,999	2	511,023	9,530.74	1.87
300,000–499,999	3	1,203,384	23,701.81	1.97
500,000 and over	7	5,941,826	106,123.52	1.79

CASUALTY AND MISCELLANEOUS.

Total all classes	32	$1,574,649	$40,257.84	2.56
Under $10,000	10	51,797	3,233.59	6.25
$10,000-$24,999	6	106,770	3,982.59	3.73
25,000– 49,999	6	210,661	6,467.37	3.07
150,000– 99,999	5	386,050	9,567.00	2.48
100,000–199,999	4	472,624	10,303.58	2.18
200,000–299,999	..	.....	.....	....
300,000–499,999	1	346,747	6,703.71	1.93

INDUSTRIAL AND SICK BENEFIT.

Total all classes	11	$2,256,688	$19,249.12	.85
Under $10,0000	..	.....	.....	....
$10,000–$24,999	..	.....	.....	....
25,000– 49,999	1	28,219	581.87	2.06
50,000– 99,999	3	225.178	1,979.83	.88
100,000–199,999	2	244,901	1,768.97	.72
200,000–299,999	3	721,437	4.189.92	.58
300,000–499,999	1	317,041	1,923.14	.61
500,000–and over	1	718,912	8,805.39	1.23

TABLE V.

RELATIONSHIP TO PREMIUM INCOME AND TO ADMITTED ASSETS OF ALL VIRGINIA TAXES, FEES, AND CHARGES, EXCEPT ON REAL ESTATE, LEVIED ON INSURANCE COMPANIES.

Kinds of Insurance.	Premium Income.			Admitted Assets Less Real Estate.		Taxes.		
	Total.	In Virginia.	Per Cent. in Virginia.	Total.	Apportioned to Virginia on Basis of Premium Income.	Amount.	Per Cent. to Premium Income in Virginia.	Per Cent. to Admitted Assets in Virginia.
Fire and Marine Cos.	$253,065,001	$4,984,824	1.97	$488,866,059	$9,620,000	$211,484.30	4.27	221
Sick Benefit Cos.	3,943,634	2,255,688	57.25	932,712	533,000	19,249.12	.85	3.61
Life Cos.	599,494,978	9,026,399	1.51	4,018,923,606	60,550,000	169,793.48	1.88	0.27
Casualty, Fidelity and Miscellaneous	108,927,329	1,574,649	1.45	190,861,927	2,755,000	40,257.84	2.55	1.46
	$965,430,942	$17,841,560	1.85	$4,699,584,304	$73,458,000	$440,784.74	2.47	0.60

The regressive character of the tax on real estate appears again in insurance. The companies with premium receipts of less than $10,000 paid over 8 per cent. of their premiums in taxes, the largest less than 2 per cent. The Virginia taxes averaged about 2.5 per cent. of premium income. This charge was over 4 per cent. on fire and marine companies, less than 1 per cent. on sick benefit companies less than 2 per cent. on life companies, and a little over 2.5 per cent. on casualty and other insurance companies. Since premium income forms a less proportion of all income in life than in other forms of insurance the difference in favor of life companies was much greater than that shown here. This is most clearly illustrated by reducing the tax to terms of admitted assets. On this basis the average tax was 60 cents on $100, or about the same rate as railroads. It fell to 21 cents on life companies, however, and mounted to $2.21, or nearly ten times as much, on fire and marine.

To summarize: we found grossly unequal taxation in real estate as between large and small properties, as between city and country, from county to county, and between different sections of the state. We found the same inequalities in the assessments of tangible personal property. We found great variations among railroads and some difference between rail-

roads on the average and the average for real estate. We discovered gross mal-administration of bank taxes, unequal public utility assessments and illadjusted taxation of insurance companies, all by methods of investigation for which statistics are peculiarly fitted.

Taxation is peculiarly a field cursed by non-expert opinion and unenlightened legislative action. I know no field of statistical inquiry yielding more positive results or where honest investigation is more needed.

STATISTICS OF THE FOOD SUPPLY IN GERMANY.*

By Robert Morse Woodbury, Ph.D., *Cornell University.*

In the last fifty years Germany has changed from a food-exporting to a food-importing nation. Her agriculture, though protected in recent years by substantial tariff duties, has not been able to supply the growing demands for food-products arising from a largely increased population. Even before the war writers had pointed out the danger of a shortage of food in case of a European conflict. When the war came Germany found herself hemmed in on all sides by enemies, and cut off from her foreign sources of supply. Her foes have been unable as yet to make progress against the German armies; is it possible that they may achieve the same end, the defeat of Germany, by starving her out? Has Germany a sufficient home-production of food-stuffs to meet her most urgent needs?

The annual excess of imports over exports of food-products in normal times is considerable. In 1912 and 1913, years of exceptionally high home production, the excess of imports of grains and potatoes alone averaged 6,250,000 tons—2,000,000 tons of wheat, 3,000,000 tons of barley and 1,000,000 tons of corn, with smaller quantities of potatoes and rice. Meat and animal products, oil-cake and agricultural products used for fodder, were also imported in large quantities.†

Various estimates and guesses of the proportion of total consumption that is imported have been made. Low estimates of the dependence of Germany upon foreign supplies of food are based on the proportion, 10 per cent., of the bread-grains and 3–5 per cent. of the meat products, that is directly imported,‡ ignoring the fact that large amounts of meat and animal and vegetable products may be derived indirectly

* Paper read at the annual meeting of the American Statistical Association, Washington, D. C., December 29, 1915.

† Kuczynski and Zuntz, Deutschlands Nahrungs- und Futtermittel, Allgemeines Statistisches Archiv., Vol. IX, 1915, pp. 114, 137, 169, 173, 185–187.

‡ Ballod, Die Volksernaehrung in Krieg und Frieden, Schmollers Jahrbuch fuer Gesetzgebung, Verwaltung und Volkswirtschaft im Deutschen Reiche, Vol. 39, p. 77.

from abroad by import of fodder and fertilizers. Ballod, a German statistician who has written on the problem of the food supply, thinks that, including all kinds of vegetable food-stuffs imported, one third of all grains and vegetable food-products is imported; of meat products, one half comes directly or indirectly from abroad.* A careful and complete estimate has been made by Kuczynski and Zuntz, the former director of the Municipal Statistical Bureau of Berlin-Schöneberg, the latter director of the Institute of Animal Physiology of the Royal Agricultural High School in Berlin. In determining the proportion of food imported to the total consumed, the different kinds of food-stuffs are compared in terms of calories, or units of heat energy, contained in the respective foods; and also in terms of the amounts of protein, or nitrogeneous compounds, a certain quantity of which is an indispensable part of the daily ration. Of the total consumption of food in the years 1912–1913, these two authors estimate that 29 per cent. of the protein and 20 per cent. of the calories were imported. Of the total grains and plant foods used for human consumption, there was imported 9 per cent. of the heat energy and 15 per cent. of the protein content. Of the total meat supply 44 per cent. of the protein and 43 per cent. of the calories were imported either directly in the form of live cattle and dressed meats, or indirectly in the form of fodder for cattle and hogs.†

These figures, relating to food-stuffs used for human consumption, give some idea of Germany's present problem. Since the war, imports have been almost wholly cut off. Imports of wheat and barley from Russia and America have been stopped. Holland, Denmark, Switzerland, and Sweden have little to spare and Rumania has been unwilling to permit free export.‡ Austria-Hungary is in no position to help Germany out.§ In addition to the loss of foreign supplies, home production has been seriously affected by the war. Five hundred thousand horses have been taken from the farms for

* Ballod, Deutsche Volksernaehrung im Kriege, Preussische Jahrbuecher, Vol. 157, 1914, p. 102.

† Kuczynski and Zuntz, *op. cit.*, pp. 153, 131.

‡ Rumania forbade the export of rye, barley, and peas and levied a heavy export tax on the export of corn. Jahrbuecher fuer National-Oekonomie und Statistik, Vol. 105, July, 1915; Volkswirtschaftliche Kronik, pp. 293–4. See below, p. 29.

§ Kuczynski and Zuntz, *op. cit.*, p. 107.

the use of the army; and the supply can not be replenished from Russia, from which the greater part of the normal import, 114,000 horses, came.* Crops in small portions of Alsace and East Prussia were damaged by movements of hostile armies.† Farm labor has been called to the front.‡ About 18 per cent. of the total males and females engaged in agriculture are males between the ages 18 and 49 and therefore subject to military duty. The fisheries on the North Sea are practically closed down.§ The import of Chili saltpeter, representing one half of the total supply of nitrogeneous artificial fertilizer, has been cut off.‖ The substitutes, a nitrogeneous compound manufactured as a by-product from coke, and nitrolin, made by electrical process from the atmosphere, are either insufficient in quantity or can be produced only at high expense.

Writers on the question of the food supply of Germany before the war were apt to be pessimistic. Since the war, in the many discussions of the food problem that have been published, the prevailing tone has been optimistic.¶ Though a large proportion of the food-stuffs consumed by the population are imported, yet in case of need there are substantial reserves to which the optimists point. Part of the abundant potato crop is now used for industrial purposes. There is annually a large surplus of sugar for export, and the sugar may be used to take the place of the missing imports, or the sugar lands may be used for other crops.** Finally, the grain used in the production of beer and starch can be used for food. In reply to these arguments it has been pointed out by Professor W. J. Ashley that the relative food values of these reserve

* Eltzbacher (ed.), Die deutsche Volksernaehrung und der englische Aushungerungsplan, 1914, p. 15.

† Gumbinnen and Allenstein in East Prussia were overrun by the Russians, and about 5–6 per cent. of the crop of Prussia was destroyed. Ballod, Die Volksernaehrung, Schmollers Jahrbuch. Vol. 39, p. 88. A small portion of Alsace-Lorraine was invaded by the French. Eltzbacher, *op. cit.*, p. 16.

‡ Eltzbacher suggests that "the greater part" of the farmers and farm laborers are in the "field." *Id.*, p. 14. In 1907, 3,146,592 males between the ages of 18 and 49 were engaged in agriculture, or 18 per cent. of the total males and females engaged in agriculture. Statistik des Deutschen Reiches, Vol. CCIII, pp. 2–3.

§ Eltzbacher, *op. cit.*, p. 14.

‖ W. J. Ashley, Germany's Food Supply, The Quarterly Review, Oct., 1915, p. 446.

¶ See K. Borman, Die Lebensmittelversorgung des deutschen Volkes waehrend des Krieges, Deutsches Statistisches Zentralblatt, 1914, Vol. VI, column 286.

** Figures for sugar beet acreage for 1915 show a marked decrease, 31.9 per cent. over the acreage of 1914. Jahrbuecher f. Nat.-Oek. u. Stat., Vol. 105, Volkswirt. Kronik, p. 290.

crops must be taken into consideration.* Foods contain protein, carbohydrates, and fats in varying proportions. Protein includes the nitrogeneous compounds which are indispensable in rebuilding nervous tissue; neither of the other two constituents can take its place. There is a large proportion of protein in meats and the leguminous plants, and a fair proportion in wheat and other grains. Carbohydrates and fats are heat-producing. Potatoes are largely and sugar is almost exclusively composed of carbohydrates. The residues from the breweries, which contain a large proportion of the protein element of the grain used for the manufacture of beer, etc., have always been used as fodder for cattle, and thus indirectly have been utilized in the production of meat. It is therefore inadmissible to consider the total amount of grain used in the production of beer as a reserve.

An answer to the question, "Can Germany hold out?" has been attempted by a group of sixteen German statisticians, agriculturists, and physiologists and their conclusions have been published in a little volume edited by Eltzbacher,† the director of the School of Commerce of Berlin. Four main problems are investigated: (1) What was the total consumption of the population in 1912–13? (2) What is the total requirement of food of the German population? (3) What is the probable home-production of food-stuffs without considering any special emergency measures? (4) How much can the supply of food available be increased by special measures to be taken? The questions in which we are most especially interested are those relating to the statistical estimates of the food-supply. The statistical work seems to have been done largely if not entirely by Kuczynski and Zuntz.‡

The consumption for the total population of 1914 on the basis of the consumption, including normal imports, corresponding to the average of the years 1912 and 1913, would be 90,420,000,000,000 calories and 2,307,000 tons of protein. It is estimated that an adult man with moderate work daily re-

* W. J. Ashley, Germany's Food Supply, The Quarterly Review, Oct., 1915, pp. 444–462, esp. p. 447.

† Die deutsche Volksernaehrung und der englische Aushungerungsplan. Eine Denkschrift von Friedrich Aereboe, Karl Ballod, Franz Beyschlag, Wilhelm Caspari, Paul Eltzbacher, Hedwig Heyl, Paul Krusch, Robert Kuczynski, Kurt Lehmann, Otto Lemmermann, Karl Oppenheimer, Max Rubner, Kurt von Rumker, Bruno Tacke, Hermann Warmbold, und Nathan Zuntz. Edited by Paul Eltzbacher, 1914.

‡ See Kuczynski and Zuntz, *op. cit.*, note 2, p. 107.

quires food with heat energy of 3,000 calories, 11 per cent. of which, or 330 calories, is furnished by 80 grams of protein. Women and children require a somewhat less amount. Calculating the number of calories and the amount of protein required for the total population of 1914, the yearly physiological requirement for efficiency is estimated as 56,750,000,000,000 calories and 1,605,000 tons of protein. The consumption for the two years preceding the war exceeded the physiological requirement, calculated on this basis, by 59 per cent. for heat energy and 44 per cent. for protein.*

The probable home-production of food-stuffs is calculated from the figures of the production of 1912–13 by deducting 5 per cent. to allow for a decrease due to lack of labor, horses, fertilizer, to the cutting off of the fisheries, and to the damage to crops in East Prussia and Alsace. The total production is estimated at 1,554,000 tons of protein and 67,680,000,000,000 calories, a slight surplus of calories over the requirement but a deficit of 3 per cent. in protein.† The Eltzbacher report suggests a number of possible methods of making up this slight deficiency: lessening of household waste, slaughter of pigs and cattle to lessen the animal consumption of grains which might serve directly for human consumption, lessening of the use of grain in industry, development of the electric process for manufacturing nitrogen, culture of moorland, etc. By these measures it is calculated that 480,000 tons of protein can be added, transforming the deficit into a substantial surplus.‡

Professor W. J. Ashley, in a review of the Eltzbacher publication, criticizes these estimates on the ground that they are too optimistic. Wherever there is room for a difference of opinion as to the home-production or as to the requirement, he thinks that the authors have chosen the more favorable basis for estimate. His criticisms of the estimates are restricted mainly to the estimates of protein.

The figures for the supply of protein available from grains and potatoes are based on the assumption that the 1914 crop would be as good as the average of 1912 and 1913, with

* Eltzbacher, pp. 20–32, 64–66.
† Eltzbacher, *op. cit.*, p. 66–67.
‡ Id., p. 194.

an allowance of 5 per cent. for war conditions. Both of these crops, especially the 1913 harvest, were unusually good. The latest revision of the official estimates indicates, according to Ashley, that the 1914 crops fell about 13 per cent. short of the average of the two years preceding.* Furthermore, the official figures overestimate the crops. Ballod, a German statistician, thinks that the official figures are 10–15 per cent. in excess of the reality. Ashley reduces the figures for the protein content of grains and plant foods on the basis of a 15 per cent. reduction of the official figures for the 1914 crop from 963,000 to 753,000 tons. Estimates for the food value of cattle and hogs slaughtered are calculated by applying to the number of animals slaughtered the figures of the Health Department for the average "dead weight" per animal. But these averages, according to Ashley, are 10 per cent. too high. That they are too high is admitted in the Eltzbacher publication, but the averages are kept, "to include certain parts of the animal fats not fully included in the 'dead weights' though they are used for human consumption."† These animal fats are perhaps 5 per cent. of the total weight. Ashley reduces the estimate for protein 2 per cent. from 346,900 tons to 340,000 tons. He further criticizes the estimate for the annual average production of 2,200 liters (about 5,000 lbs.) of milk per cow and thinks that 2,000 or 1,800 liters is nearer the truth. He compromises, however, on 2,100 and reduces the estimate for protein in the milk supply by 5 per cent., or 8,300 tons. Accepting all the rest of the figures, these reductions would bring the estimate for the total available protein down from 1,554,000 tons to 1,411,000 tons.‡

Not satisfied with reducing the estimate of the supply available, Ashley revises the estimate for the physiological minimum necessary for the total population. The minimum requirement of protein necessary for efficiency as given by the "standard German author, Voit," is 118 grams of crude or 105 grams of digestible protein. Calculated on this basis the requirement would be not 1,605,000 but 2,001,000 tons of protein. Calculated on a basis of 92 grams of digestible

* Ashley, *op. cit.*, p. 449.

† Eltzbacher, p. 49.

‡ The deduction of 225,200 tons is made from 1,636,000 tons, the supply home-produced 1912–13.

protein, as suggested by Bauer* as the lowest figure consonant with efficiency, the requirement still would be 1,853,000 tons. To meet this requirement there would be available under normal conditions only 1,411,000 tons, a shortage of 24 per cent.

Finally Ashley believes that the estimate of 480,000 tons of protein added to the supply available by the measures of the government—the prohibition of the use of grain as fodder, reduction of the stock of pigs and cattle, agitation to decrease waste by housekeepers, etc.—is too high. He thinks the prohibition of the feeding of grain to stock was largely evaded at first on account of the large profits in meat production. There was a large percentage of waste incident to the storage of food by the government. A realization of one half of the saving hoped for would be, according to Professor Ashley, an outside estimate of the results achieved. On the other hand, Germany has been able to import or smuggle in food-stuffs by way of Holland and Denmark, the imports showing a very considerable increase over normal trade.

In conclusion Ashley calculates that there is a deficit of 12–13 per cent. of the food supply required—a deficit which is indicated by the great increase in the prices of food.† The abnormally high prices bring great suffering to the working classes in industrial districts. Meetings to discuss the prices of food-stuffs have been prohibited in Saxony. The agricultural population, on the other hand, has received some benefit from the high prices. Ashley thinks it was a mistake for the government to announce in an authoritative manner that there was food enough for all. If there is food enough, the question "Why should the prices of food-stuffs rise?" will naturally be asked among the working classes, with resentment against the inefficiency of the government in failing to stop speculation.

Are these criticisms of the German estimates well taken? If the German economists might tend to err on the side of overestimate, perhaps the Englishman might be inclined to be pessimistic about the food supply of the German people! No reference is made by Professor Ashley to an article which

* Handwoerterbuch der Staatswissenschaften, Vol. VI, p. 135.

† Seventy per cent. in Berlin in one year. Ashley, *op. cit.*, p. 455.

appeared in the *Allgemeines Statistisches Archiv* in the spring of the present year, written by Kuczynski and Zuntz, who were responsible for the statistical estimates of the Eltzbacher publication.* In the later article the estimates are much more detailed, critical comments, notes, and references to sources, which are omitted in the popular edition, are given, and in some cases, data which were not before available are used to revise the earlier figures.

The first question to be taken up in examining Ashley's criticisms in the light of the sources used by the German statisticians is the revision of the estimate of protein available from grains and plant-foods. Ashley reduced it from 963,000 to 753,000 tons, or 210,000 tons. Eltzbacher allowed for a 5 per cent. reduction from the production before the war to allow for poor crops—a deduction of 48,150,† so that the discrepancy between the two is some 161,800 tons. Kuczynski and Zuntz in their revised estimates increase the allowance for poor crops, lack of labor, horses and fertilizers, losses due to the movements of hostile armies, etc., to 8 per cent. This reduces their earlier figures by 28,900 tons. The actual returns of the 1914 crop show that even this increased allowance was too low; actually the 1914 crop fell some 12 per cent. below the figures for the average of 1912 and 1913.‡ A further reduction should be made, therefore, in Kuczynski and Zuntz's figures of 30,000 tons of protein.

The remaining difference of approximately 100,000 tons is due to Ashley's reduction of the crop estimate for 1914 by 15 per cent. to allow for error in reporting the yield. In support of this procedure he appeals to the criticism of crop reports by Ballod.§ Estimates of crops in Germany, in normal times, are returned in November by a large number of agricultural experts, each of whom estimates or guesses at the average yield per acre of the principal crops in his district. The districts now average nearly 16 square miles. The figures of average yield are multiplied by the area under cultivation in each crop as reported by the communal authorities.

* See above, p. 96, note 3.

† The deduction of 5 per cent. was not restricted solely to grains, etc., used for human consumption, but included also 33,850 tons for indirect use of grains and fodder.

‡ A reduction of 12 for wheat; 12.5 for rye; 12.3 for barley, 0.8 for oats, and 14 per cent. for potatoes. Ashley's 13 per cent. reduction is therefore only slightly overstated.

§ Ashley, *op. cit.*, p. 449, note. See also the two articles by Ballod already cited.

Estimates of acreage can be compared with the results of agricultural censuses—in 1907 in Bavaria the estimates were slightly higher than the census figures.* The estimates of the communal authorities for the acreage in 1913, on the other hand, were almost uniformly lower than the results of the agricultural census of 1913.†

With reference to the estimates of average yield per acre, there is no direct way to test the figures. No agricultural census of crop production has ever been taken in Germany. In the United States estimates of crops are compared with census returns every 10 years and usually the census figures are taken as a new base for future estimates; each year the crop reporters report not an average yield for the district but the percentage yield of the present in terms of last year's crop. In Germany, there was no base to start from, the estimates have never been compared with census figures, and no one knows how far the estimated yields per hectar depart from the truth.

From 1893 to 1898 there were two different sets of crop estimates, one made by the agricultural experts (landwirtschaftliche Sachverständige), as at present, and the other by communal authorities, in most states usually in February after the harvest. In 1899 the second method was dropped, because the figures so obtained were almost out of date before they were published. These two estimates differed regularly by a considerable margin. The figures of the agricultural experts were usually 12–19 per cent. higher than the other figures.‡ It is suggested on the one hand that the experts,

* Huber, Die uebrige landwirtschaftliche Statistik, in Die Statistik in Deutschland nach ihrem heutigen Stand. Ed by Zahn, Vol. II, p. 140.

† The difference is small, not over 1 or 2 per cent. For the results of the Bodenbenutzungsaufnahme see Jahrbuecher fuer Nat. Oek. und Stat., Vol. 105. Volkswirtschaftliche Kronik, p. 295 ff. The estimates are found in the Vierteljahrsheft zur Statistik des deutschen Reichs., Vol. 23, 1914, I, p. 130.

‡ See Ballod, Gueterbedarf und Konsumtion in Die Statistik in Deutschland, Vol. II, p. 610. See also Morgenroth, Die Lebensmittelversorgung des deutschen Volkes waehrend des Krieges, Deutsches Statistisches Zentralblatt, Vol. 6, 1914, column 323. The discrepancy between the two sets of figures is even greater than Ballod states it. In Bavaria and Wuerttemberg and some other small states in this period both sets of crop estimates were made by agricultural experts. The difference in the two estimates in Prussia in 1894 varied from 13 per cent. for winter wheat to 33 per cent. for oats. By averaging in Bavaria and Wuerttemberg where the difference in the estimates was very small, the average difference is considerably reduced. The reason for the difference in these states was the slightly different time at which the two estimates were made. Since 1899, the number of crop reporters has been nearly doubled, a circumstance that might lead to greater accuracy. See Vierteljahrshefte zur Statistik des Deutschen Reiches, 1894, Vol. III, part III, pp. 38–48; part IV, p. 140; 1899, Vol. VIII, part III, p. 65; Ergaenzungsheft to part IV, p. 9, 16.

where farmers, would tend to generalize from their own good crops, and on the other that the returns gathered by the communal authorities would show understatement due to fear of taxation on the basis of the returns.

Which of these estimates is nearer the truth? How far do the estimates of the agricultural experts overstate the real harvest? The only piece of convincing evidence on the amount of overstatement is contained in an article by Ballod, which appeared in Schmoller's Jahrbuch for the present year and to which Ashley does not refer.* The amount of wheat and rye ground in mills plus the amount used for seed plus the amount fed to live-stock should equal the total amount available—the harvest plus the excess of imports over exports. The amount fed to cattle must be estimated roughly. Ballod thinks that 2,000,000–2,500,000 tons is an outside estimate of the rye used for fodder. He finds, however, that there is an excess of rye used either for fodder or due to overestimate of crops of 3,240,000 tons, or 30 per cent. of the harvest for 1908–1909, and of 3,840,000 tons, or 34 per cent., for 1909–1910. A similar excess of wheat, 620,000 tons and 1,170,000 tons, respectively, or 15 and 28 per cent. of the harvests, is found. Ballod explains the discrepancy as due to an overestimate of the rye and wheat crops of 10–15 per cent. Even making some allowance for understatement in the statistics of grist-mill production, the overestimate would still be considerable.

Ashley reduced the Eltzbacher estimates of protein from grains by 15 per cent., the larger of the two figures previously given by Ballod. Eltzbacher, however, makes an even more generous allowance than Ballod for wheat and rye used as fodder and in industry before calculating the amount of grain available for human consumption. For rye he deducts 2,708,-085 tons and for wheat 417,384 tons, or 23 and 9 per cent. of the harvest, respectively. Assuming that the percentages of the crop rather than the amount used as fodder are correct,

* In the article to which Ashley refers especially, the harvest of wheat and rye minus exports in four small East Prussian districts was expressed as a per capita consumption of bread. The consumption appeared to Ballod to be far too high. No allowance was made for use of wheat or rye as fodder or for industrial purposes. Further, an overstatement of yield in one district would not be at all conclusive as to a general overestimate. See Ballod, Deutsche Volksernaehrung im Kriege. Preussische Jahrbuecher, Vol. 157, 1914, pp. 103ff.

the basis of Ballod's calculation of overestimate is completely altered and without making any allowance for understatement in the statistics of grist-mill production the maximum error in the crop estimates would be 9 per cent. for rye and 11 per cent. for wheat, and not 15 per cent. as Ashley assumes.

The two authors, in the revision of the estimates, increase the allowance for rye used as fodder from 25 per cent. to 30 per cent. of the net harvest (after seed is deducted). This change means a reduction of 25,400 tons of protein in the supply available for human consumption. The possible overestimate of protein available from the rye crop is thus reduced to 4 per cent. There is no justification for a reduction in the crop estimates in view of this change, of more than 7.5 per cent. and a reduction of as much as that would hardly seem to be warranted on the basis of the figures given.*

On the other hand, Kuczynski and Zuntz make two important changes in their estimates, both in the direction of reducing their earlier figures. The total production of buckwheat, millet, and maize is revised, so that the protein available from these crops is reduced by 6,800 tons. The estimate of the production of beans, peas, and lentils is reduced almost half, involving a reduction in protein of 33,800 tons, or a total reduction of 40,000 tons.

The other differences in the estimates of protein available are of minor importance and are cited only to illustrate the statement that all the calculations were too optimistic. The two authors cite, as the basis of their estimate of the annual milk production per cow, the official estimates of Bavaria (1907) of 2,340 liters and of Württemberg of 1,940 liters.† Bavaria has nearly three times as many cows as Württemberg; by weighting the figures in proportion to the number of cows in each state an average of some 2,240 liters is secured. But the higher of these two figures, and that to which the greatest weight is attached, is an average of guesses made for the dif-

* The protein from wheat and rye accounts for about three fourths of the protein derived directly from grains and potatoes. The question can be waived as to whether the estimates for the proportion of the crop used as fodder are too high. If they are, they absorb, so to speak, an error in the crop estimates. The net result is to lower the amount of protein calculated as available for human consumption just as effectively as by a reduction in estimated harvest. No change has been made in the supply of meat available as a result of increasing the estimate of the amount of rye used as fodder.

† Kuczynski and Zuntz, *op. cit.*, p. 144.

ferent provinces by agricultural experts in consultation with inspectors of breeding, an altogether unsafe basis for a generalization and one that would probably err on the side of overestimation.*

With reference to the estimates of "dead weight" used to figure the total meat supply, it is admitted by the two authors that the figures used are too high, but the use is justified on the ground that some animal fats used for human consumption are not included in the "dead weights." A note states that the usual estimates of protein content are too high and of fats too low. It seems inferable that in expressing the food value in protein and calories a correction is made to give the true composition of the "dead weights."†

Ashley's criticism based on the overestimate of the "dead weights" loses its force if such a correction is made.

To sum up this discussion of the estimates of protein available: the final results do not differ much from Ashley's conclusion. Of the 162,000 tons discrepancy in the protein from grains and potatoes, an excess of 94,000 tons is admitted by the two authors in their revision and of 30,000 tons more is proved by the actual figures of the 1914 crops. Disregarding the minor items of protein in milk and the overestimate involved in the "dead weights," if a further reduction of 20,000 to 50,000 tons is made for possible crop overestimates the amount of protein available, 1,444,000 to 1,414,000 tons, corresponds fairly closely with Ashley's results. This computation leaves out of account a further reduction of protein available due to

* Die Milchwirtschaft in Bayern, Heft 78 der Beitraege zur Statistik des Koenigreichs Bayern. Hrsg. v. K. Statistischen Landesamt, pp. 18–19.

A reference is given also to a later estimate for Wuerttemberg (1910) of 2,428 liters. This figure is based on the result of milk tests on 344 cows of three breeds on 59 farms in different parts of the kingdom. The number of tests is altogether too small to form a reliable basis for generalization. Milk tests are more likely to be carried out on farms where production is above the average. Tests, for example, of 834 cows in Jefferson County, N. Y., showed an average annual production of 6,621 lbs. as compared with census figures for the county for 1909 of only 4,310 lbs. Milk tests in Bavaria are carried out on cows used for breeding.

See Die Milchversorgung in Wuerttemberg, O. Truedinger, 1914, Schriften des Vereins fuer Sozialpolitik, Vol. 140, Part IV, pp. 19–20. Truedinger made the earlier estimate for Wuerttemberg of 1,940 liters. See also H. H. Wing, The Formation of Cow-Testing Associations. Circular No. 17, April, 1913, Cornell University Agricultural Experiment Station of the College of Agriculture, Dept. of Animal Husbandry, p. 54. Figures for the tests in Jefferson County were kindly furnished me by Professor G. F. Warren, Cornell University.

† Kuczynski and Zuntz, *op. cit.*, p. 135, note, p. 139. "Infolgedessen wird meistens ein zu hoher Eiweissgehalt und ein viel zu geringer Fettgehalt angegeben. . . . Hier wurde tunlichst die durchschnittliche Zusammensetzung im 'Schlachtgewicht' beruecksichtigt."

possible loss under war conditions of home-grown fodder materials, for which Eltzbacher made an allowance of some 38,000 tons of protein.

The two authors practically concede in advance the justice of Ashley's criticism of the estimates of daily requirement of protein. After giving 70 to 80 grams as the physiological minimum for efficiency, 10 per cent. is added to allow for unavoidable waste and 5 per cent. more for a certain "excess-nourishment," in all approximately 92 grams. Ashley accepts 92 grams as the lowest reasonable minimum.

The final results of the two authors are much less optimistic than the conclusions of the Eltzbacher publication. They find a deficit of home-production of 21 per cent. of the requirement of protein and 10 per cent. of the requirement of calories; and this requirement itself means 16 per cent. less of protein and 19 per cent. less of calories than was consumed on the average before the war.

There remains the question as to the possible additions to the supply of protein which can be expected from the special measures of the government. Most of the estimates are pure guesses, without any trustworthy statistical basis. Almost half, 217,000 tons, of the total addition (480,000 tons) expected is to be achieved by changes in the keeping of livestock, lessening the waste of fodder and reducing the daily ration of some 3,000,000 "overfed" cows. The most dubious assumption in the calculation is that a saving of 249,000 tons of crude protein can be affected in the fodder ration without lessening at all the average production of milk of 2,200 liters. A calculation is made that the stock of pigs will have to be reduced by one third and of cows by one tenth as a consequence of the cutting off of the import of foreign fodder materials.* It is estimated that the prohibition of the use of bread-grains as fodder will add, if observed, 78,300 tons of protein to the supply available. Ashley thinks, and probably correctly, that the prohibition was largely evaded at first. Furthermore to reckon the entire amount of protein available in the grain estimated as used for fodder reopens the question as to a possible overestimate of this amount and of an overestimate of crop returns. In de-

* Eltzbacher, *op. cit.*, pp. 121–122. The elimination of the poorest tenth of the cows might tend to raise the average production.

fault of more certain evidence on these points, a somewhat liberal margin must be allowed.

In the revision, the two authors, if they were responsible for the estimates, seem to have realized the doubtful value of some of them. The attempt to calculate the amount added by the different measures of the government is abandoned completely. Attention is centered on the question of the supply of fodder materials, but the method of calculation is wholly altered. Instead of estimating the number of pigs and cattle that were dependent on the supplies of foreign fodder, a laborious estimate is made of the probable supply of the fodder materials of the Empire and of the total requirement of each kind of live-stock. They find that the total heat energy of fodder consumed by live-stock in 1912–13 was double the heat energy of foods used for human consumption. The actual consumption of fodder in these two years exceeded the minimum requirement as calculated by the two authors by 14 per cent. of crude protein and 8 per cent. of calories. One half of this difference might be saved by avoiding waste and reducing over-feeding: the remainder, the unavoidable waste, is added to the minimum requirement to make the practical requirement. During the war, with imports of fodder cut off, the supply is 13 per cent. below the practical requirement of crude protein and 12 per cent. below that of calories. If the entire deficit of calories and protein for both men and animals is reduced to a deficit of fodder, eliminating double counting, the available supply of protein is found to be 20 per cent. and that of calories 18 per cent. less than the practical requirement. The conclusion is drawn that the only way out of the difficulty is to reduce still further the number of cattle and pigs.

In summary the criticisms of Ashley seem to have been anticipated by the two authors in their revision, and it seems to me that Ashley's conclusions, though based in part on unsatisfactory or insufficient evidence, are substantially correct.

A few words should be said about the limitations of these statistics. They apply only to Germany proper. No account is taken of the areas of hostile territory occupied by the German armies, Belgium, Northern France, and Russian

Poland, nor of the populations of these districts. No deduction from the total food requirement is made for the possibility that the German armies operating in enemy territory could live off the country, and no addition to the requirement of food is made for prisoners of war held in Germany. The population is assumed constant from July, 1914. No account is taken further of the supplies of grain on hand at the end of the season left over from the 1913 crop. It may be that in these omissions some important factor has been disregarded.

It may be suggested that the amount of protein physiologically necessary is a quantity which has been variously estimated and which therefore offers no certain standard by which to test a deficit of food supply. Estimates are usually based either on statistics of consumption of healthy and efficient laborers or on laboratory experiments. A very low estimate of 50–60 grams daily was made by Professor Chittenden of Yale.* He made some experiments in which he showed that the norm previously accepted as the minimum requirement of protein was much higher than was absolutely necessary. It may be noted in passing that though Ashley and Kuczynski and Zuntz agree on a practical requirement of 92 grams of protein, the two authors include in it an allowance of 10 per cent. for unavoidable waste. A test to which no objection could be made would be to compare the available supply with the consumption of protein before the war of approximately 110 grams.†

In a computation of the available food supply, to deal with averages is not an entirely correct procedure. The food supply is not divided up among the population equally. Even in normal times there are some who do not get enough to maintain efficiency, and there is a large class who can afford no surplus of nourishment. For these classes a shortage of food supply means immediate loss of efficiency or suffering or both, and for these classes an increase of prices is tantamount, for

* Professor Chittenden's experiments are mentioned by Eltzbacher in defense of his own low figure of 80 grams.

† 110 grams for an adult male with moderate work. Per capita of the actual population 83.4 grams were consumed before the war, as compared with 66.7 grams reckoned on a basis of about 92 grams per adult male. See Kuczynski and Zuntz, *op. cit.*, pp. 156–158.

all practical purposes, to a shortage of food. In spite of the maximum price regulations adopted by the German government, prices of food-stuffs in Berlin in one year of war have risen 70 per cent. since July, 1914.* The well-to-do classes, do not have to limit seriously their consumption of food except in case of those food-stuffs, notably bread and milk, the consumption of which is regulated by the card system with a fixed maximum amount which any one person may buy.

But the situation has been materially changed in some respects since these estimates were made. Forecasts of the new crops indicate a much better harvest, especially of wheat and rye, than was secured in 1914. The situation in Austria-Hungary will be much improved by the success of the wheat crop of Hungary, the forecasts of which indicate a very considerable increase over that of last year. Austria normally imports some 300,000 tons of wheat: the relative failure of the 1914 harvest in Hungary made the situation much worse than usual. Germany's harvests are much more like an average crop, though probably not equal to the yields of 1912 and 1913. In another year of war, Germany's deficit will therefore be smaller than that calculated for 1914.

Furthermore, Germany has been able to import considerable supplies of animal food products from Holland and Denmark. Figures, which Ashley gives, indicate a somewhat larger import than in normal times of butter, eggs, cheese, and fish.† Germany takes almost the whole of the surplus of the Dutch fisheries.

The success of the operations against Servia has opened up Bulgaria's reserves of wheat and other grains. Her normal exports of wheat amount to nearly 300,000 tons, or 7 per cent. of Germany's home production. Some of her surplus normally goes to Austria. If all were sent to Germany and all used for food, it alone would mean an addition of 20,300 tons to the supply of protein. In addition there is a considerable surplus of corn and barley and a surplus available for immediate needs of a somewhat uncertain amount left in the country from last year's crops. Bulgaria exports an average

* Ashley, *op. cit.*, p. 455.
† Ashley, *op. cit.*, p. 454. See also New York Times, Dec. 17, 1915.

of $5,000,000 worth of animal products yearly. Negotiations with Rumania for the sale of large quantities of grain have been completed.* Rumania's surplus of wheat is much larger than that of Bulgaria, amounting normally to 1,460,000 tons.† This would mean an addition to the annual supply of nearly 100,000 tons of protein. Besides, there are large quantities of corn and barley which can be used to supply the deficiency in fodder. A rough estimate would place the surplus of these crops available for export at one fourth to one third of the deficit in Germany. With these new sources of fodder materials opened, it is possible that a larger number of pigs and cattle were slaughtered than was necessary.

In conclusion, there is little possibility that Germany can be starved. Her supplies are probably sufficient to cover the minimum practical requirement. Her food supply falls considerably short of the actual rate of consumption in 1912–13, and it must be conserved and carefully distributed to ensure a sufficiency in the last months before the new harvests are available. There are distinctly less meat and animal products available than in normal times. The serious danger, it seems to me, is that disaffection may be spread among the working classes by restrictions on the consumption of food-stuffs, and above all by the increase in prices, which may seem to them entirely unnecessary if, as the government has announced, there is really enough food for all.

* See New York Times, news items in issues of Dec. 23 and Dec. 26, 1915.

† Rumania's crop for 1915 is estimated to be 24 per cent. larger than the average of 1909–13. These figures for the normal exports are taken from the Monthly Crop Report, published by authority of the Secretary of Agriculture, Vol. I, No. 5, p. 48, Sept. 15, 1915. They are based on the average of the last 5 years, 1909–13, as reported by the International Institute of Agriculture at Rome. In calculating the available protein, the same process has been followed as is used by Kuczynski and Zuntz.

PROCEEDINGS OF THE SEVENTY-SEVENTH ANNUAL MEETING OF THE AMERICAN STATISTICAL ASSOCIATION, WASHINGTON, D. C., DECEMBER 28–30, 1915.

The seventy-seventh annual meeting of the American Statistical Association was held at Washington, D. C., December 28–30, 1915. The following program was carried out:

PROGRAM.

TUESDAY, DECEMBER 28.

8.00 p. m. First Session, Large Banquet Hall, Hotel Raleigh.

Joint Meeting with the American Sociological Society.

Presidential addresses:

E. Dana Durand, President of the American Statistical Association, "The Emergence of Unearned Increment."

Edward A. Ross, President of the American Sociological Society, "War as Determiner."

WEDNESDAY, DECEMBER 29.

10.00 a. m. Second Session, Hotel Shoreham.

Joint Meeting with the American Political Science Association; general topic, *Standardization and Government Efficiency;* presiding officer, Morris Llewellyn Cooke, Director, Department of Public Works, Philadelphia.

1. Standardization in Statistical Presentation, Roland P. Falkner, Alexander Hamilton Institute.

Discussion: Leonard P. Ayres, Russell Sage Foundation, Julius H. Parmelee, Bureau of Railway Economics, Washington, Charles H. Verrill, U. S. Bureau of Labor Statistics.

2. The Meaning of Standardization, J. Russell Smith, University of Pennsylvania.
3. Standardization of Grades and Salaries in Civil Service, Robert S. Moses, Bureau of Municipal Research, New York.

Discussion: Henry Bruère, Chamberlain, New York City, J. A. Dunaway, University of Pennsylvania.

2.30 p. m. Third Session, Small Banquet Room, Hotel Raleigh.

1. Statistics of Imports and Exports, Frank Roy Rutter, Bureau of Foreign and Domestic Commerce.

Discussion: N. I. Stone, Brooklyn, N. Y., Henry C. Emery, New Haven, Conn., Martin J. Shugrue, Boston, Mass.

2. Standards for Graphic Forms of Presentation. Discussion of the Preliminary Report of the Joint Committee on this subject representing various national scientific associations including the American Statistical Association.

Discussion to be opened by Leonard P. Ayres, Russell Sage Foundation, Secretary of the Committee.

3. Agricultural Element in the Population, Eugene Merritt, U. S. Department of Agriculture.
4. Statistics of the Food Supply in Germany, Robert M. Woodbury, Cornell University.
5. Longevity of Presidents and Members of Congress, Irving Fisher, Yale University.
6. Business Session.

THURSDAY, DECEMBER 30.

Joint Meeting, by invitation, with Subsection B, Section VIII, of the Pan American Scientific Congress.

10.00 a. m. Fourth Session, Oak Room, Hotel Raleigh.

1. The Nature and Significance of the Changes in the Birth and Death Rates in Recent Years, Walter F. Willcox, Cornell University.
2. The Influence of Vital Statistics upon the Conservation of Human Life, W. S. Rankin, Secretary of State Board of Health, North Carolina.
3. The Relation of Sickness Reports to Health Administration, John W. Trask, Assistant Surgeon General, U. S. Public Health Service.
4. Vital Statistics in Relation to Life Insurance, Louis I. Dublin, Statistician, Metropolitan Life Insurance Company.
5. Statistics of Infant Mortality, Lewis Meriam, Bureau of Municipal Research, New York City.

2.30 p. m. Fifth Session, Oak Room, Hotel Raleigh.

1. The Federal Registration Service of the United States: Its Development, Problems, and Defects, Cressy L. Wilbur, Director, Division of Vital Statistics, New York State Department of Health.
2. Vital Statistics in the States and Cities of the United States, Wilmer R. Batt, State Registrar of Vital Statistics, Pennsylvania, Charles V. Chapin, Superintendent of Public Health, Rhode Island, William H. Guilfoy, Registrar of Records, New York City.
3. Informe sobre el desarrollo de la estadistica demografica de El Salvador, Dr. Pedro S. Fonseca, of Salvador.
4. The Accuracy and Completeness of Compiled Vital Statistics in the United States, John S. Fulton, Secretary of State Board of Health, Maryland.

Minutes of the Business Meeting.

Meeting called to order by President Durand at 6 p. m.

The reading of the minutes of the previous annual meeting was dispensed with as they had already been published in the proceedings.

The Secretary presented the following report:

Secretary's Report.

Mr. President and Members of the Association:

I have the following to report in regard to the condition of the Association:

Membership December 30, 1914, date of last annual meeting		681
New members added		75
Deaths during the year	12	
Resignations	22	
Dropped	39	
Total deductions		73
Present membership		683
Net gain		2
Beside members we have:		
Subscribers (mostly libraries)		205
Domestic Exchanges		38
Foreign Exchanges		117
Total mailing list		1,043

The death of the following members has been reported during the year: Honorary Member; Professor Ivan Iaanschul; Fellow, Edward Bunnell Phelps; Members, Nelson W. Aldrich, Walter F. Allen, A. C. Dale, C. R. Henderson, Oscar B. Ireland, Thomas Lawless, Arthur T. Lyman, George E. Millichamp, Peter White, Stuart Wood.

Four regular numbers of the Quarterly Publications have been issued during the year, containing an aggregate of 481 pages, or an average of 120 pages, per number. Volume XIV, which is completed with the December number of the

present year, contains 831 pages, or an average of 104 pages per number. This is the largest volume the Association has ever issued.

Four meetings of the Association have been held during the past year; one of these was the special meeting held in San Francisco in connection with the Panama Pacific International Exposition, August 11–13. The other three meetings were what we formerly called quarterly meetings; two of these were held in New York City, on April 15 and December 3, respectively; the third one was held in Washington, D. C., April 17. These meetings took the form of a dinner, followed by round-table discussion. The average attendance was about 40.

Respectfully submitted,
CARROLL W. DOTEN,
Secretary.

On motion, it was voted to accept the report of the Secretary and to authorize its publication in the proceedings in the March number of the QUARTERLY PUBLICATIONS.

TREASURER'S REPORT.

December 22, 1914, to December 23, 1915.

RECEIPTS.

Membership dues	$1,242.32	
Sales and subscriptions	1,369.28	
Dividends and interest	143.73	
Balance on hand, December 22, 1914	741.30	
		$3,496.63

EXPENDITURES.

Printing	$2,111.33	
Postage	129.45	
Salaries and clerical service	401.28	
Expenses	13.10	
	$2,655.16	
Balance on hand, December 23, 1915	841.47	
		$3,496.63

ASSETS.

17 shares B. & A. R. R. stock @ 189 per share, $3,213.00.

S. B. PEARMAIN,
Treasurer.

AUDITORS' REPORT.

We have audited the accounts of the treasurer of the American Statistical Association, for the year ending December 23, 1915, and counted the securities in his possession. We find the accounts accurately stated and the expenditures properly vouched.

Respectfully submitted,
LEROY D. PEAVEY,
MARTIN J. SHUGRUE,
Auditing Committee.

SEVENTY-FIFTH ANNIVERSARY FUND.

To December 28, 1915.

RECEIPTS.

Cash on hand Jan. 1, 1915	$678.88	
Interest on bank deposit	8.98	
		$687.86

EXPENDITURES.

Feb. 5. Paid John Koren	$67.00	
Oct. 9. Paid Rumford Printing Co.	200.00	
Nov. 19. Paid John Koren	251.50	
Balance on hand December 28, 1915	169.36	
		$687.86

S. B. PEARMAIN,
Treasurer.

AUDITORS' REPORT.

We have audited the Anniversary Fund accounts of the treasurer of the American Statistical Association for the year ending December 28, 1915, and find the statements correct and the expenditures properly vouched.

Respectfully submitted,
LEROY D. PEAVEY,
MARTIN J. SHUGRUE,
Auditing Committee.

On motion, duly made and seconded, it was voted to accept the reports of the treasurer and the auditors, and to publish the same in the proceedings of the meeting.

It was moved and carried that a statement of the Anniversary Fund, held by the treasurer, be printed in the proceedings of the meeting.

The report of the Committee on Library was presented by Edmund E. Day. It was moved and carried that the Committee on Library be instructed to make a thorough investigation of the status of the relation between the library of this Association and the Boston Public Library and to report its findings and recommendations at the next annual meeting of the Association.

Julius H. Parmelee presented the report of the Committee on Constitution and By-Laws. The report was accepted, and after some discussion of the separate articles the following Constitution and By-Laws were adopted by unanimous vote:

Constitution.

Article I. This Association shall be denominated the American Statistical Association.

Art. II. The objects of the Association shall be to collect, preserve, and diffuse statistical information in the different departments of human knowledge.

Art. III. The membership of the Association shall consist of regular members, fellows, and honorary members.

Art. IV. Regular members shall be persons interested in statistics, elected by vote of the Board of Directors, on nomination by one or more members.

Art. V. Fellows shall be statisticians of established reputation, elected by unanimous vote of the Committee on Fellows, provided for in Article VI, who shall canvass the field at least once a year and announce elections, if any, at the annual meeting of the Association. Fellows shall have all the privileges of regular members, including the right to hold office and to vote. The number of fellows shall not at any time exceed one hundred.

Art. VI. The Committee on Fellows shall consist of five fellows, and shall be appointed by the President. The first

appointment under this article shall be made within three months after the adoption of this Constitution, and in the order determined by the President shall be for one, two, three, four, and five years, respectively. Subsequent appointments shall be made by the President at the annual meeting of the Association and for terms of five years each, but no member of the Committee may serve two terms in immediate succession.

ART. VII. Persons distinguished in the field of statistics or of public service may be elected to honorary membership by unanimous vote of the Board of Directors. Honorary members shall be entitled to all the privileges of regular members of the Association, except that they may not hold office or vote.

ART. VIII. The officers of the Association shall be a President, three Vice-Presidents, a Secretary, a Treasurer, a Librarian, an Editor, and three Counsellors. These officers shall be elected every year, beginning with the first annual meeting succeeding the adoption of this Constitution, in the manner prescribed by Article IX and shall take office at the close of the annual meeting at which elected. The President, Vice-Presidents, Secretary, Treasurer, and Counsellors shall form a Board of Directors for the government of the Association, three of whom shall constitute a quorum at any meeting regularly convened.

ART. IX. The President, Vice-Presidents, Secretary, Treasurer, Librarian, Editor, and Counsellors shall be elected in the following manner: A nominating committee of three members shall be appointed by the President, the personnel of which shall be announced in the Quarterly Publications of the Association at least three months before the annual meeting. It shall be the duty of the nominating committee to make nominations for officers to be elected at the annual meeting, and to notify the regular members and fellows by mail of its nominations at least thirty days before the annual meeting. Twelve or more regular members or fellows may make nominations for any office by submitting signed petitions to the nominating committee at any time after the appointment of the committee and up to the time of the annual meeting, but this shall not prevent the committee from making additional nominations for the same office.

If no nominations by petitions are submitted for any office, the nominee of the nominating committee may be elected at the annual meeting by *viva voce* vote. If there are additional nominations by petition for one or more offices, it shall be the duty of the nominating committee to announce such nominations, the election for such office or offices shall be by ballot, and the President shall appoint three judges of election who shall count the ballots, shall decide any question that may arise as to the validity of any ballot, and shall declare the results of the election. The candidate for President, or for Secretary, or for Treasurer, or for Librarian, or for Editor, receiving a plurality shall be declared elected, while the three candidates for Vice-President and the three candidates for Counsellors receiving the highest number of votes shall be declared elected.

ART. X. Annual and occasional meetings shall be held at such times and places as the Board of Directors may designate. Any vacancy in office resulting from death, resignation, or other cause shall be filled by election at the next meeting of the Association.

ART. XI. Amendments to this Constitution may be proposed by any member of the Association at the annual meeting, and if supported by at least one third of the members present and voting shall be submitted to the next annual meeting, where a two thirds vote of all members present and voting shall be required for adoption.

BY-LAWS.

1. At least once every two years the Secretary, acting in behalf of the Association, shall publish the Constitution and By-Laws and a list of members, and shall supply a copy to each member.

2. Each regular member shall pay annual dues of two dollars, or twenty dollars at some one time, and each fellow shall pay annual dues of five dollars, or fifty dollars at some one time.

3. The Board of Directors, as soon as practicable after their election, shall appoint two standing committees of three members each, namely, on Finance and on the Library; Five standing committees of five members each, namely on Federal

Statistics; State Statistics, Municipal Statistics, Business Statistics, and International Statistics. These committees shall serve for one year, or until their successors are appointed.

4. The Board of Directors, as soon as practicable after their election, shall appoint four associate editors, to serve with the Editor as a committee on publications, and to edit the publications of the Association. The associate editors shall serve for one year, or until their successors are appointed.

5. The Board of Directors, as soon as practicable after their election, shall appoint two assistant secretaries, who shall serve for one year, or until their successors are appointed.

6. Amendments to these By-Laws may be proposed at any annual meeting of the Association and if approved by a two thirds vote shall be declared adopted.

The Nominating Committee, consisting of Irving Fisher, Wesley C. Mitchell, and Frank R. Rutter, reported the following nominations for office in the Association during the ensuing year: President, Charles P. Neill; Vice-Presidents, Charles F. Gettemy, Joseph A. Hill, Charles H. Verrill; Librarian, Horace G. Wadlin; Treasurer, S. B. Pearmain; Secretary, Carroll W. Doten; Counsellors, John Koren, E. Dana Durand, Allyn A. Young; Editor, William B. Bailey.

On motion the report of the Nominating Committee was accepted, and it was voted to instruct the secretary to cast one ballot for the list as presented. This having been done, they were duly declared elected.

Meeting adjourned.

CARROLL W. DOTEN,
Secretary.

MEETING OF THE BOARD OF DIRECTORS.

A meeting of the Board of Directors was held Thursday evening, December 30, and the following appointments were made in accordance with the provisions of the new Constitution and By-Laws of the Association.

Assistant Secretaries—Robert E. Chaddock, New York, N. Y., and Henry J. Harris, Washington, D. C.

Associate Editors—Louis I. Dublin, Julius H. Parmelee, Carl J. West, and John Cummings.

Committee on Finance—Harvey S. Chase, chairman, Walter E. Weyl, and S. B. Pearmain.

Committee on Library—Roger W. Babson, chairman, Edmund E. Day, and Henry J. Harris.

Committee on Federal Statistics—John Koren, chairman, Thomas S. Adams, Leonard W. Hatch, Frederick L. Hoffman, and N. I. Stone.

Committee on State Statistics—E. Dana Durand, chairman, Robert E. Chaddock, Charles F. Gettemy, Henry J. Harris, and E. W. Kemmerer.

Committee on Municipal Statistics—LeGrand Powers, chairman, Frederick A. Cleveland, Fred C. Croxton, Louis I. Dublin, and Edward M. Hartwell.

Committee on Business Statistics—W. S. Gifford, chairman, Melvin T. Copeland, Julius H. Parmelee, H. S. Person, and I. M. Rubinow.

Committee on International Statistics—Royal Meeker, chairman, Roger W. Babson, Miles M. Dawson, Irving Fisher, and Wesley C. Mitchell.

Auditing Committee—Martin J. Shugrue and Ernest H. Gaunt.

CARROLL W. DOTEN,
Secretary.

REVIEWS AND NOTES.

Sweden—Historical and Statistical Handbook by Order of the Swedish Government. Edited by J. Guinchard. Second Edition, English Issue. Stockholm Government Printing Office, 1914. First part "Land and People," 781 pp. Second part "Industries," 758 pp.

In 1900 the first edition of this handbook under the editorship of Dr. Gustav Sundbärg was published in French on account of the Paris Universal Exposition. An edition in Swedish followed this in 1901 and in English in 1904.

In 1912 the present editor was commissioned to publish a new edition. In view of the Baltic Exhibition it was decided to publish a German issue and this was completed in May, 1914. It was originally planned to follow this with a Swedish issue but on account of the Panama-Pacific International Exhibition it was decided to publish an English issue first. This will be followed by the Swedish issue. The work under consideration is the second English edition.

The first volume dealing with Land and People is divided into five main divisions: Physical Geography, the Swedish People, Constitution and Administration, Education and Mental Culture, and Social Movements. To the average reader of these publications, the second and fifth of these chapters will probably possess the most interest. A large mass of statistical material is given upon moral conditions, criminality, customs and mode of life, and dwellings. This is well arranged and illustrated with maps and charts. Under social movements considerable space is given to labor questions and social politics. Such topics as Immigration, Unemployment, and Cost of Living are considered. The closing section of the book is devoted to a consideration of social movements. Under this heading we find the care of the needy and destitute, efforts in social hygiene, social rescue work, protection of children, eugenics, and the work of the Swedish National Anti-Tuberculosis Association. Two short sections are devoted to political economy and sociology and to statistics. The latter was written by K. A. Edin. It deals principally with the various statistical bureaus of Sweden and gives in some cases very brief biographies of the men who have been most prominent in statistical work in the country.

The second part discusses the natural resources of Sweden, agriculture, forestry, mining, manufacture, commerce, banking, and a general synopsis of trade and industrial legislation. All of the principal industries of Sweden are treated in a separate section. Charts are used in many cases to illustrate the growth of these industries. By means of well drawn maps, the deposits of ores and coal are shown. Other maps give the location of the railways, canals, and waterways of the kingdom.

Hundreds of illustrations are scattered throughout the volumes. No one can read this work without receiving a comprehensive impression of Sweden, her people, her resources, and her activities. The scheme of the

work was elaborate and the chapters are well balanced. The aim of the Riksdag has apparently been accomplished. The work of editing such a publication was by no means an easy one but it has been well done.

WM. B. BAILEY.

A SIMPLE METHOD FOR FINDING THE MOVING AVERAGE.

In the *Quarterly Publications* of the American Statistical Association for December, 1915, Mr. King, of the University of Wisconsin, offers a new method for obtaining the moving average of an historical variable. His method is certainly simpler than the long direct method, and also preferable to some short-cut methods. A method, however, which is still simpler than the one put forth by Mr. King has been used by the writer in statistical work in the University of Minnesota. It involves only three operations, namely, summation, subtraction, and division, whereas the other involves four.

1. Summate the items of the variable on the adding machine, taking sub-total for each item entered, including the first. The result is seen in the adduced representation of an adding machine slip which has been elaborated into a table. The sub-totals are marked with an asterisk. They may be numbered if convenient. The figures given are the average prices of cotton for the decade 1890–1899. The wave length is here for convenience taken to include only five items of the series.

Year.	Average Annual Price of Cotton in Cents per Pound. Sub-totals Marked with an Asterisk.	Five Year Group Totals.	Moving Average or Trend.
1890	8.6		
	8.6*		
1891	7.3		
	15.9*		
1892	8.4		
	24.3*		
1893	7.5		
	31.8*		
1894	5.9		
	37.7*	37.7	7.5
1895	8.2		
	45.9*	37.3	7.5
1896	7.3		
	53.2*	37.3	7.5
1897	5.6		
	58.8*	34.5	6.9
1898	4.9		
	63.7*	31.9	6.4
1899	7.6		
	71.3*	33.6	6.7

2. To obtain the total for each successive group of five items subtraction is necessary. Obviously, the total for the group of the first five items is the fifth sub-total. The total for the second group is obtained by sub-

tracting the first sub-total from the sixth; the total for the third group by subtracting the second sub-total from the seventh; and so on as far as we desire to go. In order to facilitate the process of subtraction, the most convenient device used by the writer has been to take a strip of cardboard or stiff paper cut to a size to cover the figures *intervening* between the subtrahend and the minuend. If the spacing is regular, it is necessary simply to slide the strip past one sub-total for each subtraction performed. The rectangle enclosing all the items between the first and sixth sub-totals indicates the use of the card for the first subtraction. With a little practice this subtraction can be done very rapidly. If the superior position of the subtrahend causes trouble, this may be avoided by leaving an extra space or two below each sub-total where the subtrahend may be written in, what is to the ordinary person, its conventional position.

3. To obtain the average, divide each group total by the number of items in the wave-length, in this case by five. The results are all shown on the slip, both the group-totals and group-averages being shown, the latter furthest to the right.

It is believed there is an advantage in thus placing the results of all three operations on the slip. For most purposes of publication or demonstration, the figures cannot be entered directly on the tables by the adding machine. From the slip they may be easily transposed. The slip may easily be made into table form if desired.

It is, of course, to be remembered that the average logically belongs not opposite the last item in the wave-length, but opposite the middle. But if students understand the meaning of the moving average, they will not meet with difficulty on this account.

It is very easy to verify the results. Simply summate the items of the last wave-length. If this sum is the same as the last group-total, the results are correct, except for the extreme improbability of compensating errors. If it is deemed necessary to verify the averages obtained by division, this may be done by summating the averages and the group-totals and dividing the sum of the group-totals by the number of items in the wave-length. The quotient should very closely approximate the sum of the averages.

JENS P. JENSEN.

University of Minnesota.

NOTE ON THE MOVING AVERAGE.*

I have been interested in reading the paper entitled "New Method for Computing the Moving Average," by Mr. Willford I. King, published in the December number of the QUARTERLY PUBLICATIONS of the American Statistical Association.

Mr. King proposes, by means of the adding machine, to add the yearly items, taking a sub-total after each item, to practically repeat the process,

* A similar note has been received from W. M. Persons, suggesting this improvement in the Method of Computing the Average.—ED.

suitably paste the two adding machine slips together, and by cross-subtraction obtain the remainders, which are shown in Column No. 3. These remainders being divided by seven, give the moving average.

I am writing to suggest that the process may be shortened and the cross-subtraction avoided by means of a simple device. For example, Mr. King shows the sum of the first seven items in Column No. 1, being the items for the years 1890–1896 inclusive. He then adds the item for the year 1897 and takes another total. If before taking this total he had also added in the complement of the item for the year 1890, he would have directly arrived at the second item in Column No. 3. If the adding machine has a capacity of nine figures, 100,000,000 will be one beyond the capacity of the machine. If the difference between 100,000,000 and any item is added, the result is the same as subtracting the item in question, for the carrying mechanism does not carry beyond the capacity of the machine.

The inclosed slip shows the calculations according to the plan I suggest for the first few years. It occurred to me that the use of the adding machine which I suggest may not be generally thought of, although I had supposed, before reading Mr. King's article, that the use of the complement for the purpose of accomplishing subtraction was in fairly general use.

Year.	Central Year.		Year.	Central Year.	
1890		9,203		1895	62,436
1891		8,280	1899		13,621
1892		9,157	1892		9,990,843
1893		7,125		1896	66,900
1894		6,658	1900		13,789
1895		9,446	1893		9,992,875
1896		8,623		1897	73,564
	1893	58,492	1901		15,878
1897		9,653	1894		9,993,342
1890		9,990,797		1898	82,784
	1894	58,942			
1898		11,774			
1891		9,991,720			

PERCY C. H. PAPPS.

Newark, N. J.

SUICIDE RECORD FOR 1914, BY FREDERICK L. HOFFMAN, THE SPECTATOR, NOVEMBER 25, 1915.

This article is Mr. Hoffman's twentieth annual survey of suicide in principal cities of the United States. In each of these studies special reference was made to the problem as it concerns the institution of life insurance. The present article ably reviews the literature of insurance practice on the suicide question, and recommends a thorough inquiry into

the subject with a sincere regard for the essentials of approved actuarial analysis of the available data.

We may well agree that in the experience of life insurance companies and according to the most trustworthy vital statistics, the suicide *rate* is on the increase; but it is still a matter of reserved reflection whether suicide itself has actually increased, with respect to the sharply changing characteristics of population and of registration practice. Suicide registration has been a particularly unsatisfactory element of our American vital statistics, and the observed increase in the rate over the past ten years may be deemed, in one sense, an index of improved registration rather than a measure of acceleration in the relative frequency of self-murder.

Mr. Hoffman has performed a distinct public service in publishing his annual surveys of suicide and homicide. His endeavors have added to the sum total of ascertainable facts on these two, of many, complex social phenomena.

E. W. KOPF.

IMPROVEMENT IN TRADE STATISTICS.

On February 9, Secretary Redfield of the Department of Commerce, addressed the annual meeting of the Chamber of Commerce of the United States in Washington, and explained the newly inaugurated system for compiling trustworthy export and import trade statistics.

In January, officials of the Chamber complained of inaccuracies in the published figures on exports for the year 1914. Mr. Redfield showed that the principal faults in trade statistics resulted from inadequate returns furnished by exporters and importers. The statistics are collected under laws of 1821 and the defects in the tabulations could well be ascribed to the limitations of this legislation.

New export regulations by the Secretaries of the Treasury and of Commerce correct the most flagrant abuse of failure to obtain complete statements for all shipments. No vessel may now clear from any port without a declaration being filed for every shipment. Furthermore, three men with statistical experience edit every entry before permits are issued. Import statistics may now be expected under more detailed and informing classifications. The introduction of modern tabulating machinery in the New York Custom House will shorten the time required for tabulation and will materially advance the accuracy of the published results.

E. W. KOPF.

STATISTICAL BOOKS ADDED TO THE BOSTON PUBLIC LIBRARY* DURING QUARTER ENDING DECEMBER 31, 1915.

PREPARED BY LIBRARY COMMITTEE, ROGER W. BABSON, EDMUND E. DAY, HORACE L. WHEELER.

Anuario de la América latina. Índice de industrias en español, alemán, francés, inglés, italiano y portugués. Directorgerente: Eduardo Riera Solanich. Año 2. Barcelona. 1914. Maps. 9318.a2

Babson, Roger Ward. Bonds and stocks. The elements of successful investing. Wellesley Hills. [1914.] Charts. Tables. 9332.6a34

—The future method of investing money. Boston. 1914. Chart. 9332.6a44

—The future of the railroads. Boston. 1914. Tables. Chart. 9385.973a120

Capper, Charles. The port and trade of London. London. 1862. Tables. 9387.9421

Chicago Traction Valuation Commission. Report on the values of the properties of the Chicago Consolidated Traction Company inside the city limits. [Chicago. 1910.] Maps. 9388.773a4

Gras, Norman Scott Brien. The evolution of the English corn market, from the twelfth to the eighteenth century. Cambridge. 1915. Map. Charts. [Harvard economic studies.] "Awarded the David A. Wells Prize for the year 1912–13." Bibliography, pp. 465–479. 9382.1142a5

Hooper, William Everett. Railroad accounting. New York. 1915. [Appleton's Railway series.] 9385.a33

International Institute of Agriculture. Bureau of General Statistics. Annuaire international de statistique agricole, 1911 et 1912. Rome. 1914. 9338.1a22

Leroy-Beaulieu, Pierre. Les impôts et les revenus en France, en Angleterre et en Allemagne. Paris. 1914. A study of internal revenue. 9336.27a25

Mallock, William Hurrell. Social reform as related to realities and delusions. An examination of the increase and distribution of wealth from 1801–1910. New York. 1915. 9330.1a68

McFarlane, John. Economic geography. London. [1914.] Maps. List of works consulted, pp. 527–529. 9338.a3

Pennsylvania. Department of Labor and Industry. Annual report of the Commissioner. 1st, part 1, 2. Harrisburg. 1915. Charts. Tables. 9331.0748a3

—Public Service Commission. Annual report, 1st. Harrisburg. 1915. Tables. 9381.09748

*The Library of the American Statistical Association is housed at the Boston Public Library and constitutes the major part of its statistical division.

Smith, Joseph Russell. Industrial and commercial geography. New York. 1913. Illus. Maps. Plans. Charts. Bibliography, pp. ix–xi. References are also appended to the different chapters. 9380.07a19

United States. Bureau of Labor Statistics. Foreign food prices as affected by the war. Washington. 1915. Tables. 9331.073a24.170

— —Hours, earnings, and conditions of labor of women in Indiana mercantile establishments and garment factories. Washington. 1914. Tables. 9331.073a24.160

— —Wholesale prices, 1890 to 1913. Washington. 1914. 9331.073a24.149

—Department of Commerce. Bureau of Foreign and Domestic Commerce. The pottery industry. Report on the cost of production in the earthenware and china industries of the United States, England, Germany and Austria. Washington. 1915. Tables. Charts. 9382.73a36.21

Utah. State Bureau of Immigration, Labor and Statistics. Report. 2d. 1913/14. Salt Lake City. 1915. Plates. Maps. Tables. 9317.92a2

Virginia. Special Joint Committee on Taxation. Report. 1914. Richmond. [1914.] Map. Tables. 9336.755a4

Indexing and Filing: A Manual of Standard Practice. By E. R. Hudders. The Ronald Press, New York, 1916. Pp. vii, 292. Price, $3 (postpaid).

This is a book that will appeal to statisticians as well as to business men. It is a revelation even to those who have some acquaintance with modern office devices and methods. At first thought it doesn't seem possible to write a book or even a thin pamphlet about so simple a matter as indexing and filing; but, when one remembers hours of time wasted in the vain attempt to find some paper or letter filed by the office boy or the new stenographer, he opens such a work as this with a chastened hopefulness and a predisposition to be grateful even for a little useful information.

It becomes apparent on reading this work that there is a science as well as an art of indexing and filing, and that the subject has a history and will soon have a respectable literature. The writer of this review long ago became convinced that every commercial school should give a course of instruction in this subject, and this book has confirmed that belief; it would serve as an excellent text-book for such a course.

The author describes and explains the many devices used in filing, from the simplest to the most elaborate. A large number of cuts supplement the text and make the explanations and instructions so clear that even the office boy could understand them. The theory and practice of indexing and cataloguing also receive adequate and illuminating treatment. Special chapters are devoted to purchase, sales, and credit records, filing in lawyers' offices, architectural filing, etc.

This book will fill a long-felt want. It will enable one who does not require anything elaborate or complex to plan and install his own filing system, and it will save much time and trouble in the training of clerical employees.

C. W. DOTEN.

Massachusetts Institute of Technology.

NOTE.

The following is an abstract of the recently issued population returns of British North Borneo for the year 1911, showing the racial distribution according to sex, and with the distinction of adults and children. The statement indicates an extremely complex population, and brings out the very suggestive fact that out of a total population of 208,183, only 355 are Europeans and 57 Eurasians:

DETAILS OF POPULATION THROUGHOUT BRITISH NORTH BORNEO.
CENSUS 1911.

	Adults.		Children.		Total.
	M.	F.	M.	F.	
Europeans	276	38	22	19	355
Eurasian	19	15	6	17	57
Chinese	19,354	2,845	2,157	1,646	26,002
Japanese	89	145	5	7	246
Siamese	11	1	1	4	17
Arabs	16	6	6	7	35
Soudanese	48	16	2	.....	66
Somali	.....	1	.....	.....	1
Philippinoes	166	51	46	28	291
Malays	980	298	203	131	1,612
Natives of India and Ceylon	741	60	64	37	902
Natives of Neth: East Indies	3,473	1,289	424	325	5,511
Natives of Sulu Archipelago	2,012	1,800	901	790	5,503
NATIVES OF BORNEO:					
Bajaws	6,756	6,935	4,521	4,375	22,587
Bruneis	2,148	1,965	1,456	1,308	6,877
Dusuns	26,814	28,141	16,939	16,057	87,951
Dyaks	356	22	58	69	505
Idahan	282	348	148	169	947
Illanun	429	574	303	335	1,641
Kedayan	685	731	509	530	2,455
Muruts	8,798	8,907	3,988	3,621	25,314
Orang Padas (Besayahs)	1,373	1,432	1,064	1,009	4,878
Orang Sungei	2,605	2,617	1,986	1,960	9,168
Tagals	706	842	207	157	1,912
Tambunwa	423	392	314	240	1,369
Tidongs	536	540	398	303	1,777
Tutongs	45	70	46	43	204
	79,141	60,081	35,774	33,187	208,183

F. L. H.

Publications of the American Statistical Association.

The New Series of the Association, issued quarterly, will be sent to members of the Association on payment of the annual dues of two dollars. The subscription price is also two dollars per annum. Separate copies can also be purchased upon remittance of the advertised prices.

The following list of titles includes only the most important papers published in the several issues. There is in addition a considerable amount of miscellaneous material.

VOL. I. 1888-1889. Nos. 1-8. Pp. 492. PRICE $4.00.

No. 1. Statistics of Water Power Employed in Manufacturing in the United States. GEORGE F. SWAIN. 75 cents.

Nos. 2, 3. Park Areas and Open-Air Spaces in American Cities. E. R. L. GOULD.

Key to the Publications of the United States Census, 1790-1887; with Occasional References to Other Statistical Works. EDWARD CLARK LUNT. $1.00.

No. 4. Life Insurance in the United States. WALTER C. WRIGHT. $1.00.

No. 5. Notes on the Statistical Determination of the Causes of Poverty. AMOS G. WARNER. REMARKS. SAMUEL W. DIKE.

Statistics of Divorce in the United States and Europe. SAMUEL W. DIKE. 50 cents.

No. 6. American Railroad Statistics. ARTHUR T. HADLEY.

Statistics of Municipal Finance. HENRY B. GARDNER. 75 cents.

No. 7. Prison Statistics of the United States for 1888. ROLAND P. FALKNER. 50 cents.

No. 8. Finance Statistics of the American Commonwealths. EDWIN R. A. SELIGMAN.

Divorce in France. BENJAMIN F. KELLER.

Relief of the Poor in Germany. A. G. WARNER. $1.00.

VOL. II. 1890-1891. Nos. 9-16. Pp. 470. PRICE $4.00.

No. 9. Mortgage Statistics. GEORGE K. HOLMES. 50 cents.

No. 10. The Study of Statistics in Italian Universities. CARROLL D. WRIGHT.

Statistics of Private Corporations. ROLAND P. FALKNER. 50 cents.

Nos. 11, 12. Statistics of the Colored Race in the United States. FRANCIS A. WALKER.

How to Make Statistics Popular. CHARLES F. PIDGIN.

Retail Prices in Boston and Vicinity. WALTER F. COOK. $1.00.

No. 13. The Growth of Cities in Massachusetts. HORACE G. WADLIN.

Rate of Natural Increase of Population in United States. HERMAN HOLLERITH.

The First Census of Massachusetts. SAMUEL A. GREEN.

The Commercial Death Rate. ALBERT C. STEVENS. $1.00.

No. 14. A Basis for Statistics of Cost of Production. CARROLL D. WRIGHT.

A Formula for Predicting the Population of the United States. H. S. PRITCHETT.

Weight and Longevity. T. B. MACAULAY.

Some Results of Sanitary Legislation in England since 1875. GARY N. CALKINS. 75 cents.

No. 15. The Eleventh Census. R. P. PORTER.
Criminal Statistics. ROLAND P. FALKNER. 75 cents.

No. 16. The Census Enumeration in Prussia. CARL C. PLEHN.
A Plea for the Average. GEORGE K. HOLMES. 75 cents.

VOL. III. 1892-1893. Nos. 17-24. Pp. 614. PRICE $4.00.

No. 17. Statistics of Crime in Massachusetts. FRED G. PETTIGROVE.
Development of Statistics of Religions. M. FOURNIER DE FLAIX. TRANSLATED BY ALICE R. JACKSON.
Net Profits of Manufacturing Industries in the State of Massachusetts. FREDERICK B. HAWLEY.
Classification of Trade Statistics. FREDERICK C. HICKS. 75 cents.

Nos. 18, 19. A Statistical Inquiry concerning Domestic Service. LUCY M. SALMON.
The Theory and Practice of Price Statistics. R. P. FALKNER.
Measures of Distribution. GEORGE K. HOLMES.
Statistics of Suicides in New England. DAVIS R. DEWEY.
Semi-Annual Census of Paupers in Minnesota. H. H. HART.
75 cents.

No. 20. The Establishment of an Imperial Commission for Labor Statistics in Germany. CARL C. PLEHN.
French Statistical Publications. CHARLES D. HAZEN.
Sketch of Life of Robert W. Wood, M. D. JOHN WARD DEAN.
75 cents.

Nos. 21, 22. Observations on the Measure of Change. C. H. COOLEY.
Cost Statistics of Public Electric Lighting. VICTOR ROSEWATER.
Immigration and the Foreign Born Population. RICHMOND MAYO-SMITH.
The Value of Percentile Grades. LUTHER GULICK. $1.00.

No. 23. Murders in Massachusetts. WALDO M. COOK.
Classification of Occupations in the Census. TRANSLATION OF REPORT MADE BY M. BERTILLON.
Growth of Cities in the United States during the Decade 1880-90. CARL BOYD.
The Vital Statistics of an Apache Indian Community. 75 cents.

No. 24. Statistical Data for the Study of the Assimilation of Races and Nationalities in the United States. RICHMOND MAYO-SMITH.
Report of an International Mortality Standard, or Mortality Index. JOSEPH KÖRÖSI.
Character and Volume of the Money of the United States. MAURICE L. MUHLEMAN.
Fluctuations in the Secured Circulation of the National Banks and their Relations to the Prices and Investment Values of Bonds. CHARLES A. CONANT.
Currency Reform in Austria-Hungary. DR. JULIUS MANDELLO.
Comparative Statistics of Primary Education. E. LAVASSEUR.
Results of Recent Investigations on Prices in the United States. F. W. TAUSSIG.
Geographical Concentration: an Historic Feature of American Agriculture. JOHN HYDE.
The Course of Wages in the United States since 1840. CARROLL D. WRIGHT.
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